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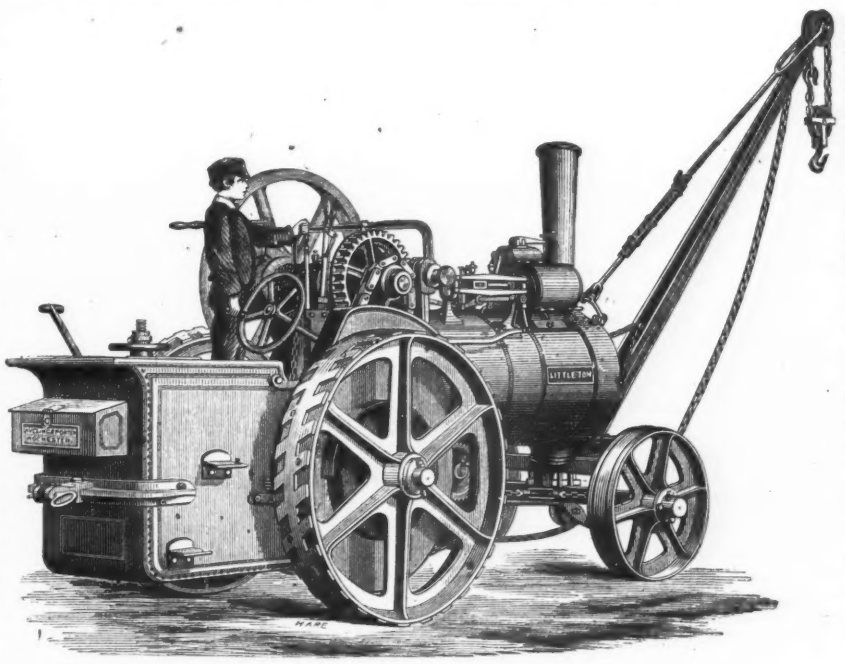
Combined Traction Engine and Steam Crane, adapted to Ordinary Roads.

THE accompanying illustration is an adaptation of the ordinary Road Locomotive to the purposes of a portable Steam Crane, a machine that of itself suggests many useful applications. As will be readily seen, the crane is but an addition to the Traction Engine, and can, of course, be used for the great variety of purposes for which it is designed, in addition to that of lifting and lowering heavy weights, such as blocks of stone or marble, heavy timbers and castings, and packages or material of various descriptions. The engine is not devoid of novelty in detail as well as in the combination of a Steam Crane with a locomotive for common roads.

The power is communicated directly from a crank shaft to the shaft of the winch barrel immediately behind it. From this counter shaft a pitch chain drives the main axle, or rather one of a pair of bevel wheels of a "jack in the box" motion on that axle, which gear, though strong, is worked into a very small space between the fire-box and the right-hand driving wheel. The beveled wheel next the fire-box is keyed fast on the axle, and that outside next the off-wheel is in one with the wheel; the motion of both wheels is therefore, under ordinary circumstances, equal, but when unequal resistance takes place a certain play is allowed (as in all cases where this gear is used) between the driving wheels. It would, however, be inexpedient to leave the engine always at the mercy of this compensating arrangement, and therefore the left-hand wheel can be released from the axle, in all AVELING'S Engines, by withdrawing a pin in the box, and the off wheel can be clamped to the axle by placing a clutch on the outside of the wheel. The winch-barrel moves free on the counter shaft till thrown into gear at the same time that the locomotive motion is thrown out, when the crane is required. The hoisting chain passes under the boiler and upon the gib, which is simply formed of two T irons, and pivoted on a ball and socket joint, capable of turning in any desired direction. The steering chains are taken reversely on to a horizontal shaft under the boiler, which is worked by a worm and pinion which can be managed from the foot plate; and so convenient are all the arrangements that the whole is under the control of one person, who alone manages the crane, and drives and steers the engine.



COMBINED TRACTION ENGINE AND STEAM CRANE.

This engine was used at the meeting of the Royal Agricultural Society at Oxford, England, in July last, and did excellent work in removing the heavy machinery and packages as they arrived at the show yards for exhibition.

Mr. W. C. OASTLER, of 43 Exchange Place, New York, is Messrs. AVELING and PORTER'S agent in America.

Dr. Bastian and Spontaneous Generation.

I FIND that the "Address" which it was my duty to deliver at Liverpool, fills thirteen columns of *Nature*. The "Reply" with which Dr. BASTIAN has favored you occupies fifteen columns, and yet professes to deal with only the first portion of the "Address." Between us, therefore, I should imagine that both you and your readers must have had enough of the subject; and, so far as my own feeling is concerned, I should be disposed to leave Dr. BASTIAN and his reply to the benign and Lethean influences of Time.

But I am credibly informed that there are persons upon whom Dr. BASTIAN'S really wonderful effluence of words weighs as much as if it were charged with solid statements and accurate reasonings; and I am further told that it is my duty to the public to state why such distinguished special pleading makes not the least impression on my mind. With your permission, therefore, I will do so in the briefest possible manner.

The first half of Dr. BASTIAN'S "Reply" occupies seven columns of your number for the 22d of September. In all this wilderness of words there is but one paragraph which appears to me to be worth serious notice. It is this:

"In the first place, he does not attempt to deny—he does not even allude to the fact—that living things may and do arise as minutest visible specks, in solutions in which, but a few hours before, no such specks were to be seen. And this is in itself a very remarkable omission. The statement must be true or false—and if true, as I and others affirm the question which Professor HUXLEY has set himself to discuss is no longer one of such a simple nature as he represents it to be. It is henceforth settled, that as far as *visible* germs are concerned, living beings can come into being without them."

If I did not allude to the assertion which Dr. BASTIAN has put in italics—it is because it bears absurdity written upon its face, to any one who has seriously considered the conditions of microscopic observation. I have tried over and over again to obtain a drop of a solution which should be optically pure, or absolutely free from distinguishable solid particles, when viewed under a power of 1,200 diameters in the ordinary way. I have never succeeded; and, considering the conditions of observation, I never expect to succeed. And though I hesitate to speak with the air of confident authority which sits so well on Dr. BASTIAN, I venture to doubt whether he ever has prepared, or ever will prepare, a solution, in a drop of which no "minutest visible specks" are to be seen by a careful searcher. Suppose that the drop, reduced to a thin film by the cover-glass, occupies an area ½ of an inch in diameter; to search this area with a microscope in such a way as to make sure that it does not contain a germ 1.004 of an inch in diameter, is comparable to the endeavor to ascertain with the unassisted eye whether the water of a pond, a hundred feet in diameter, is or is not absolutely free from a particle of duckweed. But if it is impossible to be sure that there is no germ 1.004 of an inch in diameter in a given fluid, what becomes of the proposition so valuable to Dr. BASTIAN that he has made your printer waste special type upon it?

I now pass to the second part of the "Reply," which, though longer than the first, is really more condensed, inasmuch as it contains two important statements instead of only one.

The first is, that Dr. BASTIAN has found bacterium and leptothrix in some specimens of preserved meats. I should have been very much surprised if he had not. If Dr. BASTIAN will boil some hay for an hour or so, and then examine the decoction, he will find it to be full of bacteria in active motion. But the motion is a modification of the well-known Brownian movement, and has not the slightest resemblance to the very rapid motion of translation of active living bacteria. The bacteria are just as dead as those which Dr. BASTIAN has seen in the preserved meats and vegetables; and which were, I doubt not, as much put in with the meat, as they are with the hay, in the experiment to which I invite his attention.

The second important statement in the second part of the "Reply" is:

"Professor HUXLEY is inclined to believe that there has been some error about the experiments recorded by myself and others."

In this I cordially concur. But I do not know why Dr. BASTIAN should have expressed this my conviction so tenderly and gently as regards his own experiments; inasmuch as I thought it my duty to let him know, both orally and by letter, in the plainest terms, six months ago, not only that I conceived him to be altogether in the wrong, but why I thought so.

Any time these six months Dr. BASTIAN has known perfectly well that I believe that the organisms which he has got out of his tubes are exactly those which he has put into them; that I believe that he has used impure materials, and that what he imagines to be the gradual developement of life and organization in his solutions, is the very simple result of the settling together of the solid impurities, which he was not sufficiently careful to see, in their scattered condition when the solutions were made.

Any time these six months Dr. BASTIAN has known why I hold this opinion. He will recollect that he wrote to me asking permission to bring for my examination certain preparations of organic structures, which he declared he had clear and positive evidence to prove to have been developed in his closed and digested tubes. Dr. BASTIAN will remember that when the first of these wonderful specimens was put under my microscope, I told him at once that it was nothing but a fragment of the leaf of the common bog moss (sphagnum); he will recollect that I had to fetch SCHACHT'S book "Die Pflanzenzelle," and show him a figure which fitted very well what we had under the microscope, before I could get him to listen to my suggestion; and that only actual comparison with sphagnum, after he had left my house, forced him to admit the astounding blunder which he had made.

To any person of critical mind, versed in the preliminary studies necessary for dealing with the difficult problem which Dr. BASTIAN has rashly approached—the appearance of a scarlet geranium, or of a snuff-box, would have appeared to be hardly more startling than this fragment of a leaf, which no one even moderately instructed in vegetable histology could possibly have mistaken for anything but what it was; but to Dr. BASTIAN, agape with speculative expectation, this miracle was no wonder whatever. Nor does Dr. BASTIAN'S chemical criticality seem to be of a more susceptible kind. He sees no difficulty in the appearance of living things in potash-alum, until Dr. SHARPEY puts the not unimportant question, whence did they get their nitrogen? And then it occurs to him to have the alum analyzed, and he finds ammonia in it.

And as to the elementary principles of physics—in his last communication to you, Dr. BASTIAN shows, that he is of opinion that water in a vessel with a hole in it, from which the steam freely issues, may be kept at a temperature of "230° to 235° F. for more than a hour and a half." I hope that Professor TYNDALL, whom Dr. BASTIAN scolds as authoritatively and as unsparingly as he does me, will take note of this revolutionary thermotic discovery, in the next edition of his work on Heat.

It is no fault of mine if I am compelled to write thus of Dr. BASTIAN'S labors. I have been blamed by some of my friends for remaining silent as long as I have done concerning them. But when, because I have preserved a silence, which was the best kindness I could show to Dr. BASTIAN, he presumes to accuse me publicly of unfairness, and to tell your readers that my Address "is calculated to mislead" them, I have no alternative left but to give them the means of judging of the competency of my assailant.

T. H. HUXLEY.

Jermyn street, October 10.

The Uses of Iron.

IRON cuts away the rawness of utter barbarism in the shape of the axe which clears the forest. It exhibits itself as the foremost vassal of civilization in the plough which turns the soil, and the scythe which cuts the crop. It proceeds to give the town its huge water-pipes, the individual the delicate hair-spring of his watch. It then furnishes the nails, chains, and anchors, as well as composes the cannon of our gunboats. But unquestionably the full value of iron is not grasped till we come to the magic word—railways. We cannot, perhaps, more forcibly illustrate this fact than by inviting the reader's attention to the position of iron-retaining Belgium. Its relation to iron-bankrupt nations is most enviable, most fortunate. In the first six months of this year it exported 1,657 tons of rail to Spain. Belgium happens to have iron now. Spain only used to have it. Belgium can sell her iron across the counter in iron-worshipping 1870. Spain, as an iron-disseminating country, flourished magnificently, only to collapse before the dawn of this iron-at-any-price age of steam. From 1711 to 1718 the quantity of iron sent from Spain to Great Britain averaged 1,560 tons. From 1729 to 1735 the average was 1,770 tons. After about 1750 the exportation grew less, till in 1795 it ceased altogether; and now iron is *imported* from Belgium by Spain. Again, Belgium during the first half of the present twelve months provided Russia with 19,566 tons of rails. History, on the other hand, tells us how in Russia there has always been, till it would have been most useful, a wealth of iron ores, though in early times we find a penury of information about

them. In 1569 a treaty was drawn up, which allowed the English the privilege of smelting iron ore in return for teaching the Russians how to work the metal, and on condition of their paying a half-penny for every pound they exported. Previous to his journey in foreign lands, PETER THE GREAT threw his whole soul into iron. He himself toiled in iron works. He then apprenticed himself to the trade in Saxony. He obtained, as the nucleus of artistic skill, a dozen workmen from the King of Poland. In obedience to his commands, in 1719 Colonel HERRING travelled methodically throughout Europe, with a view of draining dry all the sources of information anent iron. His return was the signal for setting up wire manufactories, forges for steel, and all the thousand-and-one appliances of iron. Thus Spain and Russia have had their cakes. They cannot eat their cakes and retain their iron too. Belgium "comes up smiling," and supplies them both—at famine price. —*English exchange.*

The Preservation of Timber, Showing the Necessity for Preventing the Rapid Destruction of the American Forests.

A Paper read before the New York Liberal Club, on November 4th, by DR. ADOLPH OTT.

"THE problem of the preservation of timber," says the French Academician DUMAS, "constitutes a question which may be placed in the first rank among the most important social economic questions." Indeed, there are few problems of which the successful solution is more closely connected with the general welfare of man than this. Timber is an article of a daily growing importance. It is true that peat and coal may replace it, as fuel, but there is scarcely a mechanical art which could be followed without the use of wood. There are sixty-six occupations enumerated in the census which depend in whole or in part upon wood as their raw material for manufacture and commerce, employing a total number of 476,623 artisans, representing, with their families, a population of over 2,000,000. How closely some of those occupations are connected with the consumption of wood, is shown by the fact that a single gun factory in Europe, during the first two years of the American civil war, consumed 28,000 walnut-trees to supply gun stocks for the American market. How great then, we may ask, must be the consumption of timber in the great furniture factories, in ship building, etc., from which no article is turned out, which would not require more wood, than that necessary for the stocking of a musket. For the construction of railroads in the United States between 1850 and 1860, 65,897,020 pieces of timber were used, and besides this, there were in construction and not yet brought into use, on January 1, 1862, about 17,827 miles of new road, for all of which new sleepers were needed. Again, the maintenance of the roads, stocks and fires for railroad purposes, in this country, requires $141,085,104 worth of wood annually. The amount of lumber required on farms alone, for houses, barns and fences, during the last thirty years, is estimated at $101,070,000 worth of forest annually. Increasing population swells consumption. The former is now probably advancing at the rate of over one million souls per annum, but while the ratio in the increase in population between 1850 and 1860 was but 35.59 per cent., the increase in the consumption of lumber was 63.09 per cent. This fact is very significant, as it goes to show, that notwithstanding the use of iron in manufacturing and for building, the increase in the demand for wood is far greater than the increase in population. After having given some statistical data upon the consumption of timber, I will now show that the supply of our country in this most important raw material, instead of keeping pace with the demand, is diminishing every year.

The great State of New York, according to FREDERICK STARR,* still furnishes more lumber than any other State, but as long ago as 1850 it reached its maximum. While the State, from 1850 to 1860, increased her population by 783,341, she diminished her supply of lumber almost one million of dollars each year. Five other States also diminished their supplies of lumber during these ten years. The Commissioner further says: "The black walnut has almost wholly disappeared from the State. The wild cherry and cucumber-tree are great strangers, the hard maple and hickory in some sections are nearly gone, while entire counties, formerly heavy with hemlock and pine, can with difficulty supply now and then a farmer with a knotty sill for a small barn."

Some of the older States are, even now, dependent for their lumber upon the newer States. For black walnut, the eastern States are already sending to Wisconsin and Michigan, while immense quantities of pine are brought from the upper lakes and the head waters of the Mississippi to the Atlantic and Gulf seaboard. In the Northern and Middle States the supply of timber is also diminishing. Railway ties that once cost thirty cents, are now worth double that price. The old ones are therefore permitted to remain, until they are completely decayed, in order to save expense, and are a source of those frightful railroad disasters of which we hear so often in this country.

From another authority† we learn that in less than five years all woodland in this Union within five miles of any navigable stream will be exhausted, if the consumption and destruction continues as heretofore.

The facts, as presented here, may be regarded from different points of view. They assume, in the first place, great importance, when we reflect that there exists a most intimate relation between the climate of a country and the extent of its forests. Wooded soil is favorable to the production of springs, but when a country is stripped of its forests the springs and rivulets are dried up, and "the poorer plant-children of Nature" —the mosses, disappear. The Turks, although only a so-called semi-civilized people, seem to be aware of this fact. There is, to-day, in the neighborhood of Constantinople, a splendid

* American Forests, their destruction and preservation. Report of the Commissioner of Agriculture for the year 1865.

† Hunt's Merchant's Magazine, February, 1866.

woods of the finest beech and oak, which is protected by law, because it feeds a spring, the water of which supplies the whole city.*

It is true that when the climate is insular, such as is the case in England, Denmark, Finland, and in our own, near the great lakes, the clearing of the forests has been and may be effected without any of those injurious consequences experienced elsewhere. On the contrary, since a superabundance of moisture had existed there before, the climate has become more agreeable and healthful. But it is different with an inland country; there care must be exercised not to disturb the equilibrium in the household of Nature.

Look at Italy, Spain and Greece. Although within that brief period of time called "historical" they have been known as among the most productive, they are now scarcely able to furnish food for their inhabitants, for the once most verdant pastures and the most fertile fields have been turned into arid, sandy deserts.

But forests are also useful along the sea-shore, especially when it is low and sandy, as their roots bind together the loose sand, and prevent its being swept inland by the sea-winds.

Dr. KARL MULLER, in his "Buch der Pflanzenwelt" (Book of the World of Plants), relates the following instance, which most strikingly shows the truth of the above:

"King FREDERICK WILLIAM, of Prussia, wanted money. One of his noblemen, wishing to secure his favor, promised to procure it for him, without loan or tax, if he would permit the thick pine forest to be removed which stood along the Gulf of Dantzig. The King allowed it to be cleared. The financial operation was perfectly prosperous; the King had money. But in the natural consequences of the operation the State received such an injury that its effects remain even to this day. The sea-winds can now sweep unimpeded over the barren hills, the Frische-Haff (Fresh Gulf) is already half filled with sand—its depth being now in no place more than twelve feet—and sedges grow for some distance in its shallowing waters, threatening to convert it into a monstrous swamp; the anchorage extending between Ebling, the sea, and Konigsberg is endangered, and the fishing in the Haff injured. In vain have all possible efforts been made, through sand-heaps and pastures of coarse sea-grass, to cover these hills with matted roots. The wind mocks at every attempt. The operation of the Prussian nobleman brought the King two hundred thousand thalers; now the people would give millions if they had the woods back again."

In this country, it is especially the West, with its wide-reaching, treeless prairies, which feels the need of forests, perhaps, more than any other portion. It is the farmer who needs them for his grain, as a means to shelter it against winds and hurricanes. Fruit growers need them for protection of their orchards, and to check that dry atmosphere which sweeps through them, shrivelling up their finest specimens.

"I have a vivid recollection," says ANDREW J. FULLER, in his *Forest Tree Culturist*, "of spending several years near the grand old prairies, where the wind went and came without hindrance. One afternoon, on coming home, I found my house unroofed, and the place where a green-house stood in the morning swept clean—not a flower-pot, brick, or piece of glass left, to show that I ever possessed a conservatory of fine plants. I can call to mind several instances of like character, each of which leads me to think that a *strong* protection is often required to enable the settler in the West to *keep* his foothold after he has obtained one."

Forests are known to preserve an equilibrium of temperature. There is no part of the world, except the interior of Asia, that needs more the presence of a controlling influence upon the climate than the great West. The surface of the Missouri and Mississippi are insufficient to produce much effect, but we are certain that large and numerous forests would check those extreme changes of atmosphere which so often render all the labors of the farmer useless.

Leaving aside the importance of woodland as a climatic agent, there is another danger of national bearing which is awaiting us. It is the *famine* of wood, which, ere long, will take place, if no steps are taken to stop the wasteful system of squandering timber hitherto in vogue.

Coal and iron may be produced in a few days, grain and cotton in a few months, wool and meat in a few years, but timber in not less than one generation, and such as is daily cut down in not less than five to fifteen generations.

When we see the price of lumber raised from $18 per thousand feet in 1855, to $24 in 1860, and $45 in 1865, when we reflect that *sixty-six trades* and nearly *half a million artisans* depend upon wood as their raw material for manufacture, and when we consider that the demand increases each year far more than the nation grows in population, there are certainly serious apprehensions to be entertained.

How can this evil be remedied? This is the question which we now propose to answer. Our first reply is, PLANT TREES! our second is, PRESERVE TIMBER FROM DECAY! It is evident that a great result would soon be attained, if the wood at present used for ships, buildings, railroads, bridges, piers, etc., was protected from rot. How immense would be the gain, if it only lasted twice as long as unprepared wood does, not to speak of a longer time. What greater achievement can be thought of? The invention of the telegraph, of photography, the discovery of the process of gas-making —all these may be more ingenious, but they are certainly not as intimately connected with the wants of society than is the art of preserving wood. Yet there are only a few practical subjects which are less understood among the people than this. Why this is so, I do not know, but I hope that you may say, after leaving this room, that the subject is not as dry as you anticipated—nay, that it is certainly worthy of our interest and participation.

First, before all, what are the causes of decay? † It is generally supposed that the rotting of timber is merely induced by the action of the oxygen of the air. Others admit that microscopical parasites of vegetable nature play an important part

* Harland Coultas. "What May be Learned from a Tree," page 178.

† A more detailed account on the decay of timber has been published by the author, in a former number of this JOURNAL.

in it; but consider the presence of albuminous matter in the sap as necessary, which, according to them, must also be first in a state of decomposition before it allows the growth of those organisms. In order to throw light upon this most important subject, we propose first to tabulate a number of well-observed facts.

Sound timber, when immersed in water, without access of air, will withstand decay for almost an unlimited time. This is proved by the piles upon which the dwellings in the Canaries rest, which were erected in the time of the Conquest, in 1402, they being just as sound now as if they had been freshly felled. Roots of trees that have been submerged in marshes are rarely found decomposed. This is stated to be the case with the utensils discovered in the lake dwellings of Switzerland, Bavaria, and Lombardy, which must be at least ten thousand years old. HARTIG also describes a cypress stem with over three thousand rings, representing the same number of years, which, though submerged, had only partially turned into brown coal.

With respect to the action of the atmospheric air, it may be asserted that the same, even when moist, will not produce rot, if the wood has been well steamed, or exposed to the action of running water for a sufficient length of time. In England it is customary to lay the timber designed for threshing-floors and wainscoating in fresh water for several weeks. When again dry, and not exposed to damp, such timber will last for an incredible period of time. This tends to demonstrate the fact that the substance which induces decay must be foreign to the timber itself. This substance is the juice that is chiefly contained in the vascular tissue, which forms a link between the bark and the wood. The German botanist, SCHACHT, in all instances of decayed timber, has met with fungi and lichens. The destruction of timber by decay, after the same has been felled, must, therefore, be considered as being produced by similar causes to those which brought on the disease of the vine, potato, mulberry tree, and other cultivated plants, which make the years 1845, '48, '53, '57, and others, forever painful to memory.

Hand in hand with the spread of the fungi, continues the decomposition of the ligneous tissue. Access to moisture and air, as well as a certain degree of heat, are necessary. In regard to the air, fungi require oxygen for their generation. When air-dried, steamed, or chemically treated, and afterwards dried, wood commences to rot, it is a sign that moisture has again penetrated; for it is scarcely to be admitted that in all these cases the sap had been entirely removed. Timber decomposes the *easier* the more sap it contains, and if trees are felled when the vessels are overflowing with juice, one may look with certainty for diminished durability of the timber. Timber is not always the more durable the more dense it is, but rather when the even fineness of the grain continues to the pith of the stem.

If the primary cause of the perishable nature of wood be the sap, or rather the nitrogeneous substances contained in it, a means of protection is naturally suggested in the removal of the albumen; or else, in so combining it with other substances that it forms a compound which is insoluble in water, and not susceptible to spontaneous decomposition. Both methods may be accomplished; but the latter is by far more practicable, as by the injection of a foreign body the pores are filled, and it is thus more likely that the entrance of perishable substances will be prevented.

It is not the purpose of the present paper to give a history of the art of preserving wood. Such a history would alone form the subject of a paper. I intend only to relate which methods have been employed on a large scale. One of these is that of KYAN; it was proposed in 1832, and consists in the injection of corrosive sublimate into the timber. However, this process is expensive, and the preservative compound is washed out if such wood is immersed in the sea. Sulphate of copper was first largely used by MARGARY, (1832,) and may be employed for preventing dry rot in timber, but it is not of great value for structures exposed to the action of the water. The same may be said of the pyrolignite of iron, employed by BOUCHERIE. PAYNE'S process consists in first injecting a solution of sulphate of iron into the wood, and afterwards one of carbonate of soda. Double decomposition ensues, the result being the formation of oxide of iron. With the practical working of this latter process I am not acquainted. BURNETT uses chloride of zinc, which forms an insoluble coagulum with the albumen of the sap. This process, as I am informed, is in use by some of the railroad companies in this country, and is highly recommended. One of the very best plans, however, that of BETHELL, to whom patents were granted in England, in 1838 and 1848. Several modifications of this process are at present extensively employed in America. The preservative compound used is pitch-oil, a liquid obtained in the distillation of coal-tar. According to high authorities this acts in the following way: 1st. It gives stability to the constituents of the cambium and cellulose of the young wood. 2d. It absorbs and appropriates oxygen which is within the pores of the wood, and so checks, or rather prevents the eremacausis of the ligneous tissue. 3d. It acts as a positive poison to the lower forms of organisms, and so protects the ligneous fibre from the attacks of fungi and other parasites.

One of the most famous men, who ever plead for the timber of his country was BERNHARD PALLISY, the "Potter of the Tuilleries," who died in the Bastile for his religion in 1589. (Vide G. P. MARSH, "Man and Nature," page 296.) Having expressed his indignation at the folly of man in destroying the woods, his interlocutor defends the policy of felling them by citing the opinion of divers bishops, cardinals, priors, abbots, monkeries and chapters, which, by cutting their woods, have made three profits—the sale of the timber, the rent of the ground, and the good portion they received of the grain grown by the peasants upon it. To this argument PALLISY replies: "I cannot enough *detest* this thing, and I call it not *an error*,

but a curse and calamity to all France; for when the forests have been cut, all arts will cease, and they who practice them will be driven out to eat grass with Nebuchadnezzar and the beasts of the field. I have divers time thought to set down in writing the arts which shall perish when there shall be no more wood; but when I had written down a great number, I did perceive that there could be no end of my writing, and having diligently considered, I found there was *not any* which could be followed without wood." In a discussion which followed, the urbane Secretary of the Club, Mr. D. T. GARDNER, in an eloquent address, said that unless the forests of this Union were protected by laws of forestry, we would be compelled to import timber before forty years. The total area of woodland in the United States was only 100,000,000 acres, but the reckless manner in which it was cut down, was well calculated to create alarm. The wholesale destruction of trees in the New England States, had there made fruit a thing of the past, and, if no protective measures were taken, fruit-growing would be driven out of our own and the other Middle States. The facts presented to the Club by Dr. OTT in his clear and able paper, were to him positive evidence of the "individualistic" theory of government. He closed (amid applause) by reiterating his claim for government protection of our forests.

The President of the Club, Professor BELL, called attention to the fact, that the influence of forests on the climate had been treated by Mr. BECQUEREL (a distinguished French scientist) in a recent memoir, in a most complete and able manner. He pointed out that the aridity of the plains surrounding Babylon in Asia, and Tunis and Carthage in Africa, when contrasted with their ancient fertility, was due, in a great measure, to the soil being stripped from its trees.

Prof. CHARLES A. SEELY, the Nestor among the chemists of this city, stated that he agreed fully with the lecturer, concerning the source of decay of timber. The injection of mineral salts was useless, as they were re-dissolved and removed from the wood, when the latter was exposed to moisture. An experience of thirty years had proved that creosote oil possesses all the requisite properties for the complete protection of wood upon both land and marine works. He then gave a very interesting account of his system of preserving timber. The same is an important improvement of the Bethell process, and has been in practical operation at Chicago, at St. Clair Flats, in the treatment of the timbers in the Government Canal, recently constructed, and by the Chicago, Burlington and Quincy and other railroads for ties, car-timbers, platforms, etc. He then went on to describe the bore-worms, which are the most formidable enemies of ships and marine works. There exist several species of these animals, some belong to the *Teredinitæ*, others to the *Pholadæ;* they are natives of the tropical seas, but are now to be found in all the seas of the temperate zones. The most dangerous is the *Teredo navalis*, of which one individual is able to produce 1,874,000. eggs They do not eat the wood, in which they bore, but simply perforate it, in order to secure a house. The peculiar perforations of these worms were illustrated by two very fine cross-sections of piles—the one sawed from a pile, which had been extracted after fourteen months' immersion from Charleston harbor, and the other from New York harbor, both of which, with other highly instructive specimens, were kindly presented to the Club by W. T. PELTON, Esq., General Manager of the Creosoting Works, New York.

The subject was further discussed by Messrs. LAZARUS, BRIGHT and WILCOX.

Iron and Its Manufacture.

An address by A. W. HUMPHREYS, Treasurer of the Sterling Iron and Railway Company, delivered at the Fair of the American Institute.

INTRODUCTION—HISTORICAL.

WITH the almost ceaseless hum of machinery in motion, which has justly been considered one of the great attractions of the Fair now so successfully drawing to a close, still sounding in our ears, and nearly the whole of it made from iron, cast, or beaten, or twisted into forms of use and beauty, it is certainly quite unnecessary to expatiate on the importance of iron, or its constantly recurring and ever-increasing necessity in our daily life. The greater or less use of iron has well been pronounced a fair measure of the degree of the real civilization, and extent and variety of useful industry, which prevail in modern countries, and is, perhaps, the surest single means of readily judging of any people's position in the family of nations. The manufacture of iron was one of the earliest industries requiring joint or associated action, of the labor of several individuals to produce one specific end, the reduction of iron ores having begun very early, and being too difficult for one man to accomplish, to any extent, unaided; and its production quickly necessitates a more or less crude commerce, for nowhere does a family or tribe make its own iron without also producing a certain surplus to be bartered off to the less fortunate or less skillful; and this manufacture and barter, begun almost as soon as men ceased to live entirely by the chase, has continued constantly supporting or stimulating manufactures and commerce, and they have attained the stupendous development of our own day, when every sea is blackened by the smoke of engines of iron steamers, and the wild beast is startled on every prairie and in every jungle by the shriek of the iron horse running on the iron rail.

For what uses iron has already become a universal convenience or necessity we all know, and the catalogue is too long to be even run through in a single afternoon; but after the wonderful strides of the past half century in the manufacture and consumption of this the really precious metal, what man so bold as to attempt a successful prophecy of its future utility: while it is almost as difficult to trace its early real history, stretching back into the dim twilight of man's existence, when shadows and realities are inextricably mingled. That TUBAL CAIN is one of the earliest workers in iron, is of course a familiar to e e who has read an article or heard a lecture upon iron, and its tolerably frequent use seems to have been familiar to many of the Bible writers. OG, King of Bashan, had an iron bedstead; chariots of iron, harrows, and other tools of iron, are spoken of, and a pen of iron conveyed a sufficiently familiar idea to make it a convenient figure for the Prophet JEREMIAH; while the Israelites were early promised, as especially desirable, a land whose stones are iron. In HOMER, both iron and steel are mentioned, and, in the twenty-third book of the Iliad, a mass of iron, only so large as a strong man might throw to some distance, is offered as a valuable prize at the funeral games of PATROCLUS; in the words of BRYANT's spirited translation,

> "Again Pelides placed before the host
> A mass of iron, shapeless from the forge,
> Which once the strong Eetion used to hurl;
> But swift Achilles, when he took his life,
> Brought it, with other booty, in his ships
> To Troas. Rising he addressed the Greeks:
> 'Stand forth, whoever will contend with this,
> And if broad fields, and rich, be his, this mass
> Will last him many years. The man who tends
> His flocks, or guides his plow, need not be sent
> To town for iron; he will have it here.'"

At Babylon the huge stones of the bridges were held together by the bands of iron, fixed in place by molten lead. Later, THUCYDIDES tells us that the walls of Pireus were fastened in the same way. The Ninevites made tools of iron; and small objects of art made of iron, or iron and bronze, were found by LAYARD in tombs of early date. And through all the nations of high antiquity, iron is mentioned, almost always in a way that shows it to have been a partially common, but always highly esteemed metal. Indeed, from the difficulty of working it with the primitive means at the command of men just emerged from barbarism, it was constantly held at a high price. Iron was exchanged for brass, weight for weight, and, whatever the age of the world, we find substantially the same fact at the same stage of a nation's development; only 150 years ago, BOTACHOFF, in Russia, having bartered iron for an equal weight of copper coin. So, also, in the older ages, as now, those best skilled in the production and manipulation of iron held a certain pre-eminence, and in some instances almost the only claim some of the smaller peoples have to a mention in the page of the historian, or which prolongs to our day that slight recollection, or indirect mention, which is their share of fame, has no title but their ability to wrest this metal from the tenacious grasp of combined impurities, and thus make it useful to themselves, and to their neighbors a coveted implement or dreaded weapon.

Thus the Chalybes, a once powerful Arminian race, famous formerly for the quality of their iron, continue to celebrate their superior production and perpetuate their own memory by furnishing us the root of the word chalybeate. They, as other early iron-workers, left slight record of their processes or operations; ARISTOTLE indeed mentions that their arenaceous ores were washed, and he also partially describes the operation of making wootz in India; and DIODORUS SICULUS says that in the island of Ethalia the ores were roasted, broken fine, perhaps partially reduced to blooms, and sold for iron-making; but these and other scanty particulars contain but little of instruction or warning for us. Slight knowledge we possess of the manufacture and treatment of iron in Ancient India, China, and Egypt, where there is plenty of evidence of its early use and importance, but only meager information as to the methods of obtaining it from the ores, and only deserve notice as showing how soon this metal began its influence and proved its importance. We are only sure that it was *wrought* iron that was produced and employed, and not *cast* iron, which is a comparatively recent production, and it is probable it was all obtained by a primitive direct process, from rich and easily-reducible ores.

Down to the time of the Romans, iron was too scarce and high to be of general use, but they employed it with comparative freedom; and perhaps, in the absence of files of any scientific press, which now quickly promulgates any new discovery, and the progress made in the adoption of new materials, or fresh application of old ones, nothing shows more succinctly the change which had taken place in the increased use of iron under that powerful race, than the fact that HOMER speaks of death as a sleep of brass, while VIRGIL, with the same idea in his mind, conveys it familiarly to his public by calling it a sleep of iron. The Romans introduced the manufacture of iron to the Iberian Peninsula, and Spain for a long time furnished not only metal to her neighbors, but also skilled workmen to those who wished to enter upon its manufacture for themselves; and probably France is indebted to Spain for what early knowledge of iron working she possessed, while through France the practice passed on to Germany, and settling among the Hartz Mountains, its numerous forge-fires helped furnish that extraordinary stock of goblin stories and fairy tales which were the delight and terror of our childhood. Further east and north, in Russia and Sweden, a knowledge of iron metallurgy probably came to them in a rude way from still farther east, where the hordes of Indiamen had long made the celebrated wootz, a steel of high quality, though made in the most primitive way, or perhaps from China, where iron and its magnetic properties have been known for ages. But at a later date all knowledge of the art of this manufacture as now practised, came mainly from England, and, therefore, it is to her progress that we turn for the proper history of iron and its improved manufacture, as we know it. In Britain, it is extremely probable, but not certain, that the use of iron was known long before the invasion of CESAR, though we are entirely ignorant of what may have been the method of its manufacture. With the occupation of the southern end of the island by the Romans, came quite extensive workings of the rich ores near the sea, and subsequently the Danes carried on the reduction of the same deposits of ores so largely, that at a still later date the piles of cinders left by them supplied many blast furnaces, for a long time, with material for the production of pig-iron, the more perfect operation of the blast furnace extracting iron from what was worthless slag to the crude operations of Romans and Danes.

EARLY METHODS.

The method employed by all the early workers of iron, of whose operations we know anything, was similar to that still in use in India, in Borneo, in Madagascar, and in Africa, and consisted in heating as hot as a natural draft of air, or that artificially supplied by the crudest of bellows, would permit, rich ores of iron in contact with incandescent charcoal, and hammering the viscid mass until the earthy impurities were expelled and an irregular-shaped lump of nearly pure iron remained—the "mass of iron, shapeless from the forge" of HOMER, and which—still produced, by slight modifications of the same process, in numerous localities throughout the known word—we call a bloom of iron, from the old Saxon word *Bloma*, the *Bloma Ferri* of the Doomsday Book—and which is hammered into bars or tools as wanted. This early manner of producing iron continued, with slight change, the universal method until the discovery of cast iron, and, together with its various modifications and off-shoots, patented and unpatented, are all different branches of what is known as the direct process of making iron, being a production of malleable-iron directly from the ore, at one process, in distinction to the now more common manner, called the indirect method, which first smelts the iron ore by means of the blast-furnace, and then eliminates from the resultant pig-iron its carbon and other impurities, by puddling or other means, until malleable or wrought-iron is obtained. That this indirect and roundabout way should be now generally adopted seems almost paradoxical, and an inventor of one of the improved direct processes, for such inventors are numerous, being led by an *ignis fatuus* to attempt the short cut across, instead of making the best of the road around, asks, very pertinently, why convert iron already malleable (in the ore) into cast-iron, to be reconverted, at much labor and cost, into malleable iron again? The question is an obvious one, and the only answer is, that thus far the indirect process has proved the most useful for the reduction of the majority of workable ores, in large quantity, all direct processes hitherto employed being applicable only to rich, selected, and easily reducable ores, wasteful of fuel, prodigal of labor, or irregular in their result. It is undoubtedly the dream of every iron-smelter who thinks much, or dreams at all, to find some method of obviating the use of the blast-furnace, but no commercially successful way has yet been found of realizing this dream on a large scale—that is still one of the not improbable achievements of the future.

The terms *wrought-iron* and *cast-iron* may occasionally lead to confusion and misunderstan ding, and it should be constantly borne in mind that iron is iron, however and from whatever ores obtained. Wrought, or malleable-iron, is nearly pure iron, and is malleable and ductile, while cast-iron, as well as pig-iron, which is only a form of cast-iron, is a compound of iron and carbon, with some other impurities usually existing previously in the ore in too large or too intimately combined quantity to have been entirely removed by the action of the blast-furnace, and is neither malleable nor ductile. Malleable castings, of which keys, the iron-work about a horse's harness, and many small articles are made, is cast-iron, in which carbon was originally almost the only impurity, and which, by a process of cementation, has been so nearly removed as to make the castings slightly malleable, though destitute of fibre, which is developed in wrought-iron, but not at all ductile.

THE INVENTION OF THE BLAST-FURNACE.

To properly trace the history of the present iron manufacture, we have only to go back 500 years, to the development of the process of making pig-iron by the blast furnace, at a date which cannot be fixed with precision, but about the beginning of the fifteenth century. It is probable that the gradually increased height of the little furnaces or forges, formerly in use, with the greater intensity of blast, also gradually increased, finally led to the complete melting of the ore, and so by the final addition of some earthy flux, cast-iron was obtained but where and by whom the change was turned to any practical account is unknown, though the furnaces erected to make only pig-iron seem to have been in France, or what is again, unfortunately, the debatable land between France and Germany; and one of the earliest English makers of pig-iron imported a workman from France to teach him the art. Butif France can claim the origin of the manufacture, England soon took and has maintained since the front rank in the quantity made, though to Sweden we still look for a superior quality of many descriptions of iron. The quantity of iron made in England was for a time seriously checked by want of fuel. Down to the beginning of the eighteenth century, charcoal had been the only fuel employed to any extent in the manufacture of iron, and the immense forests of Russia gave her, for a time after the manufacture was established there, a certain advantage, and she sent large quantities of iron to England, where the drain of timber for iron-making had been so great, that in 1581 stringent laws were passed to prevent the consumption of timber in any new iron-work within twenty-three miles of London, or fourteen miles of the Thames, such legislation being necessary to prevent a famine of fuel, the whole kingdom being then dependent on wood; this and some additional legislation having failed of its object, it was finally forbidden to use any timber for charcoal for making iron.

Some fuel was necessary, and the DUDLEYS spent much time and money in their experiments in the use of pit-coal, finally succeeding in making iron by its use, but, through various obstacles, many of them thrown in the way by jealous charcoal iron makers, not being able to establish it as a regularly accepted article.

For nearly eighty years after the final abandonment by Dudley of his persevering trials and partial successes, nothing was accomplished towards the practical solution of the problem

until, finally, in 1735, ABRAHAM DARBY, of Colebrookdale, succeeded where so many others had failed, and the manufacture began a fresh period of prosperity, though still only partial, for the introduction of mineral coal necessitated further improvements which the state of mechanical arts made still impracticable, and England continued partially dependent on Sweden and Russia. In 1760, SMEATON erected, at the Carron Works, the first large blowing-cylinders, and these, furnishing the larger quantity of air necessary with pit-coal, or rather the coke from pit-coal—raw coal being yet unused—showed iron-masters in what direction lay the chief difficulty hitherto preventing the complete success which had been expected to follow DARBY'S discovery; while, at about the same time that SMEATON was constructing his large cylinders, WATT was improving the steam-engine; and he had so far perfected it, with the aid of BOULTON, that in 1788 iron-masters were beginning generally to employ his double engine, which supplied the power necessary to work the large blowing-cylinders, thus completing what DARBY had begun; but it extended no further than the blast-furnace and the manufacture of pig-metal. Another step had been needed for the speedy and economical conversion of pigs into bars; this was supplied theoretically by a patent issued to PETER ONIONS, in 1783, in which the *rationale* of the puddling process was described and the principles involved fully covered. The next year HENRY CORT, of Gosport, took out a patent covering the practical use of the puddling process, and the use of grooved rolls, and to CORT is generally ascribed the merit of both inventions; and he has been styled the Father of the Iron Trade; although, as a matter of fact, the mode of puddling described by neither ONIONS nor CORT is precisely followed at the present time. CORT spent a large sum in perfecting and introducing his inventions, and had what seemed the shrewdness to get a Government official interested in his patent, and to furnish a part of the capital necessary, and ONIONS sank out of sight. CORT'S Government friend was caught, however, in a defalcation, or "irregularity," having, in fact, stolen the money he advanced to CORT. The Government seized the patent; it was locked up in court, and CORT finally died a poor man, ruined by what has proved to be the means of wealth to England.

PROGRESS OF THE MANUFACTURE IN ENGLAND.

These improvements laid the foundation of England's supremacy as an iron-producer; they speedily came into general use, and the production of iron, aided by the fostering care of the Government and the unusually high price of foreign iron, rapidly increased. As the completion of these improvements, about 1790, was the commencement of the present era of iron-making in England, it may be worth while to consider for a moment her previous and succeeding position in this industry, from a commercial point of view. The quantity of iron made in the kingdom nearly sufficed for the consumption of Great Britain until the passage of the stringent fuel laws above spoken of, and there were neither imports nor exports of any great quantity until the seventeenth century. Statistics of the whole product of the British Island previous to 1715 are not to be had; in that year there were estimated to be about three hundred furnaces in operation, and the price of pig iron was about £6 per ton. From the dearness of fuel and the operation of the laws against the employment of charcoal at iron works, the production gradually fell off, until in 1740 there were only fifty-nine furnaces in operation, producing 17,350 tons per annum of pig iron, while the net imports of iron of all descriptions, mainly from Russia, Sweden, and the American colonies, were about 20,000 tons. Then came DARBY'S success with pit-coal, and the make immediately began to increase, and continued to do so moderately until, in 1788, the total production of Great Britain was 68,300 tons, and her net imports about 15,000 tons. Then came SMEATON and WATT and CORT; the duty on bars was put at fifty-six shillings per ton, the value of bar iron being about £18 per ton, and the manufacture fairly began the prosperity it has ever since retained, with occasionally a dull period of a year or more. In 1796 an additional duty of £1 per ton was laid upon bars, a rise of about thirty per cent. took place in Russia, and the manufacture increased so fast that, to quote TOOKE, "the produce of iron proceeded so rapidly that, with the aid of further duties, amounting almost to a prohibition of importation, it not only kept pace with the increasing demand, but actually nearly superseded the use of foreign iron in this country, and furnished a surplus for exportation." In 1797, the production was 125,000 tons. So strong had been the stimulus, that in 1801 there were building or in blast forty-seven new furnaces, 125 being then the total number of the old ones. Let it be borne in mind that no new process had been discovered since 1790, nor had any special improvements been made meantime in furnace machinery; the increase was due entirely to the increased demand, to a rise in foreign iron, caused mainly by this increased demand, and by the action of the Government in so arranging the duties that Great Britain might herself reap the full benefit of the changed circumstances, carefully sustaining the feeble steps of this branch of industry while thus in its infancy. In 1806 the total number of furnaces in Great Britain was 173, making 258,000 tons per annum, an average of less than 1500 tons to each furnace. In 1825 there were 364 furnaces, of which 261 were in blast, making 581,000 tons per annum. The duty at this time on bar iron was £6 10s. per ton, having been gradually raised to this figure since 1796, and Great Britain, from being an importer, had so changed her relative position in the iron world that her net exports were 90,000 tons.

THE USE OF HEATED AIR.

There was still no further change in modes of manufacture, but in 1828, Mr. J. B. NEILSON, of Glasgow, took out his patent for the use of heated air, instead of the cold blast, which had alone, until then, been used to support internal combustion in the blast-furnace. Whatever merit we may gladly concede to the predecessors of Mr. NEILSON for their improvements, it is certain that no single invention in the manufacture of pig-iron has been followed by so great benefits, or occasioned so marked advance as the use of the hot blast; although it deserves to be called a discovery rather than an invention, for, in the words of Dr. PERCY, "there is no reason to believe that the patentee had, at first, any adequate conception of the value of his invention, and the great influence it was destined to exert upon the smelting of iron." But the iron-masters were not slow to perceive the great advantages it offered, and promptly availed themselves of them, so that by 1835, it is said that the heated blast was in use at every furnace in the kingdom, with a single exception, and the quantity of coal necessary to smelt a ton of iron was reduced, in three years, from 8 1-20 tons, coked, to 2¼ tons, used raw, actually consumed in the furnace, and 8 cwt. required to heat the blast, or a total of 2 tons 13 cwt. of raw coal, the Calder works having demonstrated, in 1831, the needlessness of coking when hot blast was employed, while later the expense of any extra fuel for heating the blast was dispensed with, the waste gases from the top of the furnace being used for that purpose. This latter improvement originated in France, where, in 1811, M. AUBULOT took out a patent for their employment and utilization, reserving to himself, however, only their use as far as connected with his own business, the cementation of steel—giving to iron-masters, with singular generosity, not only all the benefits they could derive in other ways from his patent, but carefully instructing such as chose to apply to him in the best way he knew of collecting the gas, although he foresaw at least a part of the enormous advantages which would finally result from his idea. But little was actually done with the waste gases, however, to assist in smelting, until, in 1845, Mr. BUDD took out a patent in England for the utilization of the gases for heating the blast, and soon applied his principle, not only to the stoves, but to the generation of steam in the boilers, at his furnaces, and since that time it is almost the universal practice to employ only the heat from the combustion of these gases for those purposes, and at some furnaces their employment is carried still further, and ore is calcined by them in kilns especially adapted for that purpose; though whether there is as yet any real economy in this, at large furnaces, remains, to a certain extent, an open question. The people of the United States have especial reason to hold Mr. NEILSON in grateful remembrance, for, without hot blast it would be almost absolutely impossible to smelt iron with anthracite coal, the experiment of doing so with cold blast having been thoroughly and carefully but unsuccessfully tried in the United States, in France, and in Great Britain, the earliest record trials having been made as early as 1820, near Mauch Chunk, Pa., and next in France in 1827; but it was only when aided by hot blast that Mr. CRANE, in Wales, with ovens built by Mr. NEILSON himself, finally achieved success with this king of fuels, in 1837, though GEISSENHEIMER had in 1833 taken out a patent in the United States for the use of anthracite, but with no practical results. Again, at Mauch Chunk, in August, 1838, this time with hot blast, and, it is asserted, without a knowledge of Mr. CRANE'S success, an attempt was made to employ the Pennsylvania anthracites, and a blast of five weeks is claimed to have been perfectly successful, the furnace being owned by BAUMAN, GUITEAU & HIGH. They stopped, from want of ore, in January, 1839, and, after somewhat enlarging the furnace, again blew in at the end of the following July, and continued in blast till November of the same year, having produced about two tons of iron per day, when working best, with a blast heated to about 400 degrees. The size of the furnace was 5½ feet bosh by 21½ feet high. The quantity of coal consumed per ton of iron made, I am unable to state.

The Pioneer furnace, at Pottsville, was the next furnace successfully employing anthracite coal, and the same site is still occupied by an anthracite furnace owned by Messrs. ATKINS BROTHERS, though the old stack was torn down in 1853, and a larger furnace built on the same foundations. It was blown in by BENJAMIN PERRY, with some general assistance from DAVID THOMAS, in July, 1839, and completed his first blast in January, 1840.

The above statements regarding the first use of anthracite seem to me well authenticated by documents written by the parties interested at, and immediately after, the dates mentioned above, and I believe may be relied on, though there has been some controversy upon whose brow should rest the *corona muralis* of success in this peaceful struggle, and I have taken corresponding pains to determine the conflicting claims. —*N. Y. Tribune.*

[TO BE CONTINUED.]

Scientific Administration.

No reflecting Englishman can contemplate the great events of the present time without desiring to extract from them such warnings and instruction as may be serviceable to his country in case she should be drawn into war. Accordingly the press teems with discussions on every branch of the military art. We leave these to others. In what respects the constitution, the discipline, the training, and the arming of one army are superior to those of the other, it is scarcely the function of this journal to point out. Taking the broad fact that the Prussian army has, up to the present point, proved itself superior on the whole to that of France, and indeed to any army that has ever existed—a fact that no unprejudiced person will deny—let us ascertain, if we can, whether there may not be recognized some one broad cause to account for so broad a fact.

In this inquiry we have been almost forestalled by the Chancellor of the Exchequer at Elgin. Mr. LOWE recited the lessons which he considered we have to learn from the Prussians. He spoke of their "intelligence," their "organization and docility," their "extraordinary knowledge, forecast, and diligence." He enumerated nearly all the qualities than command success. But there was one word which that profuse enumeration did not contain—a word which Mr. LOWE no doubt felt unable to utter, and that word is—Science. A Government which refuses aid to astronomers anxious to observe so rare a phenomenon as a total solar eclipse, cannot be expected to vaunt the prowess of science. Mr. LOWE'S statement of the causes of Prussian success was therefore incomplete; it was a mere reckoning of the bricks of the building, without a word of its architecture and design.

The Prussians, whatever their other qualities, are emphatically a scientific people, and to that predominating characteristic first and foremost are their recent military triumphs due. We do not mean that because they are great chemists, astronomers, and physicists, therefore are they necessarily great soldiers; so narrow a proposition would hardly be tenable. What we mean is that the spirit of science possesses the entire nation, and shows itself, not only by the encouragement given throughout Germany to physical research, but above all by the scientific method conspicuous in all their arrangements. What does the word Science, used in its wider sense, imply? Simply the employment of means adequate to the attainment of a desired end. Whether that end be the constitution of a government, the organization of an army or navy, the spread of learning, or the repression of crime, if the means adopted have attained the object, then science has been at work. The method is the same, to whatever purpose applied. The same method is necessary to raise, organize, and equip a battalion, as to perform a mechanical experiment. It is this great truth that the Germans, above all other nations, if not alone amongst nations, have thoroughly realized and applied. In all the vast combinations and enterprises with which they have astounded the world, no one has been able to point to a single deficiency in any one essential element. Every post has been adequately filled and every want provided for; from the monarch, the statesman, and the strategist, to the lowest grade in the army—each department complete, each arm of the service, whether cavalry, infantry, or artillery, trained to its own special duties, and efficiently equipped for their performance. This is the method of science, literally the same method which teaches the chemist to prepare his retort, his furnace, and his re-agents, before commencing his experiment.

This, we maintain, is the great lesson, of a material kind, which the war should teach us. Where is our science? At the Admiralty and the War Office, partisan placemen preside over technical administrations. Is that science? Under pressure of the newspapers or of private influence, a ship of war is built by an amateur in spite of the demonstration of our professional adviser that she must be unsafe, and she goes accordingly to the bottom with 500 souls in the first gale of wind. Is that science? One-half of the forces on which we reckon for the defence of the nation is composed of patriotic volunteers, with whom training is optional, and to whom efficient officers and arms are denied. Is that science? The government of London, the greatest metropolis in the world, is parcelled out to scattered knots of ignorant, sordid tradesmen, on whom no ingenuity has ever been able to fix a shadow of responsibility. Is that science? Have we before us the crudest outline of the strategical and military operations with which it is proposed that an invasion of this country should be repelled? Coming political policies always, in England, cast their shadows long before. Have we any indications of a coming military policy? Have we the means of calling together, in a short space of time, properly provided with the necessaries of a campaign, the forces requisite for carrying out a given military policy? Do we know, for instance, how our volunteers, who are reckoned on, man for man, as equivalent to regular troops, are to be employed?

We fear it is a terrible truth that absence of scientific method is as conspicuous with us as its presence is with the Germans. As a nation, we have never realized the necessity for system and completeness in utilizing our material resources. The use for the scientifically trained mind has, in our idea, been limited to chemicals and the like.

In courage, energy, intelligence, and wealth, natural and acquired, England need shrink from no comparisons with other nations, but she has yet to awake to the want of that something in her arrangements that shall enable her to turn her enormous advantages to the best account. Science, using the word in its sense of the method applied to things, not to the things themselves, is that something.—*Nature.*

MINING SUMMARY.

Colorado.

EIGHTY THOUSAND DOLLARS A MONTH.

We take the following facts in regard to one of the new mines at Grand Island from an article in the Central City *Herald*: A month ago the purchase was made of the Cariboo mine by Mr. CUTTER for Mr. BREED, and the west half transferred to their possession. During the past thirty days, nearly two hundred tons of ore have been sent to Hill's works by Mr. CUTTER, from the west half of the lead. A larger amount could have been shipped, but the main object seems to have been to develop the mine and get it in good working order for future operations. Of the above-mentioned quantity, nearly three tons of selected ore, valued at over $10,000 per ton, have been obtained. The remainder consists of first-class ore which runs from 240 to 800 ounces per ton, varying in different portions of the mine, and of second class, seldom yielding below 100 ounces. The ore embraced in these two classes represents a value of over $40,000, and with the selected ore, makes a total of between $60,000 and $70,000 obtained from the west half of the lead within the past thirty days, or first month of Mr. CUTTER'S efficient and energetic management of the mine. Between ten and twelve thousand dollars' worth of ore have also been taken out in the same time, from the east half of the mine, worked by the old Cariboo Company while engaged in sinking a new shaft. The yield of ore is remarkably uniform, and shows no signs of failure. The pay veins vary in width from twenty inches to three feet. The main shaft is now

down ninety feet, and the new or west shaft thirty-five feet, from both of which ore is being taken—likewise from the drift. A shaft house 130 feet in length is being built over the mine by Mr. CUTTER, and a smaller one further east by the Cariboo Company.

The Georgetown *Miner* of the 10th inst. has the following summary of mining news:

JEFFERSON COUNTY SILVER MINING COMPANY.

This company lately purchased the Napoleon lode, situated on Columbian mountain, Montana district, and have let a contract to SAMUEL P. ALLEN and JOHN THOMPSON, both experienced miners and men of integrity, to sink a shaft about two hundred and twenty feet on the vein, and drive a cross tunnel a little over three hundred feet in length to strike the vein at the bottom of the shaft. The shaft has been sunk to a depth of one hundred and two feet, and the cross-cut has been driven into the mountain a distance of seventy-four feet. The timbering is substantially built, and the ladder way is strong and convenient. A good blacksmith shop is constructed near the mouth of the tunnel, and the car wheels and the lumber for a car track is on the ground. The vein has an average breadth of five feet, with well-defined casings. The pay deposit, grey silver-bearing quartz and rich galena, has a breadth of about eight inches. The indications in the bottom of the shaft are that the drifting ground has been reached.

MENDOTA.

Work is being actively prosecuted on the west end of the Mendota. DUBOIS TOOKER, who is the owner of this end of the mine, has run a tunnel a distance of fifty feet, intersecting his shaft at a depth of thirty-five feet. This shaft is located one hundred and fifty-five feet from the discovery shaft on the lode, and is now one hundred and five feet deep, or seventy feet below the end of the tunnel. Mr. TOOKER is still sinking the shaft, the bottom of which carries twenty inches of the best ore the mine ever had. When the shaft shall be one hundred feet below the floor of the tunnel, drifts will be run both ways, and a large amount of stoping ground will be opened. There is out on the dump on the west shaft of the lode about seventeen tons of ore obtained in sinking the shaft. The ore from the Mendota mine is rich in both silver and lead, the first class ore running from 250 to 300 ounces of silver to the ton, and the second class from 80 to 100 ounces. The Rockford company, who are the owners of the east half of the lode, are pushing ahead in the work of development, and are also in good ore and plenty of it. Developments prove that this mine is one of the best veins on Sherman mountain; it certainly carries an immense body of mineral of good grade. A number of tons of Mendota ore have been taken to JOHN COLLOM'S works at Swansea, four miles below Georgetown, and returns can soon be expected therefrom, and the actual percentage of the lead it contains be determined by a working test.

MORRIS TUNNEL.

Some time since we reported the striking of a lode in the Morris tunnel, Columbia mountain, and also that drifting would be commenced on the vein. We have now the pleasure of reporting that the drift discloses a vein of pay ore. The lode was cut at a distance of one hundred and seventy-five feet from the mouth of the tunnel, and a drift has been run south-westerly on the vein a distance of sixty-four feet. A visit made this week to the tunnel, and a personal examination of the vein, convinces us that it is in good pay. The drift evidently has penetrated the north-easterly end of a pay chimney in the vein; this is clearly proven to our way of thinking. In the roof of the end of the drift the vein is probably six inches in width, and in the floor it is fully eighteen inches. The vein carries two seams of ore, one on each wall, and the gangue between is filled with mineral in seams and bunches. The character of the crevice material is such that it is most admirably fitted for concentration, the mineral being fine galena and blende. The actual percentage of mineral in the gangue can, of course, only be made known by an actual run in some concentrator, but we are fully satisfied that the amount will be found sufficient to pay, especially as the ore proper is very rich, with a strong probability that the gangue itself carries silver. We have good reason to believe, that certainly within twenty feet a good body of solid ore will be found, the amount of ore having rapidly increased every foot since the edge of the pay-chimney was cut. The tunnel is now two hundred and sixty feet in length, and the heading exhibits signs of the presence of another lode. Work is being actively carried on, and a progress of two feet per day is made in the drift on the lode. The main shaft, ninety feet deep, has passed through the disturbed ground usually found in all mines near the surface, and is now in solid material, where the walls are well and clearly defined. About seventy feet from the surface two levels have been run, one east fifty feet, the other west forty feet. Thus far the workings have disclosed no lean ground, but a continuous deposit of good ore from the surface to the bottom of the shaft, and in both levels also. A good wagon road has been constructed, by which the transportation of the ore is easily and cheaply accomplished. A comfortable sleeping house, 12x18, and situated near the mine, has been constructed, also a barn 12×18, a blacksmith shop 12×12, a whim house 20×20, and a shaft house 20×30. One portion of the whim house is fitted up for a dining hall, where the miners take their meals. The hoisting works, the ladder ways and the timbering in the mine are all models of neatness, utility and substantiality. The management of the mine is under the superintendency of C. A. HOYT, Esq.

GENERAL NOTES.

During the last seven months the Terrible has shipped over seventy tons of first-class ore, and not, as it has been reported in the Central City *Register*, nineteen and three-fourth tons in ten months. Arrangemens have been completed by the Pine Silver Mining Company, through their agent, to work the Belmont mine during the winter months. The last lot of ore, eleven and a-half tons, treated at the International mill, gave a yield of $113 per ton, coin value The lower level, 177 feet in length, is in good ore. It is the intention of the agent to drive this level 200 feet this winter. The Stewart Silver Reducing Company started up their mill again on Wednesday morning last. The mill has been idle for a few days, waiting the arrival of ore, after having been running steadily for six weeks, during which time 334 tons of ore have been run, and the gross product in silver is $31,011 18, being eighty per cent. of the value of the ore. This would make the coin value of the ore treated average about $118 per ton, and as the ore was from forty-six different lodes this may be taken as a pretty good test of the average value of our ores, at least of such part of them as is treated at home. A contract has been let by the owners of the east half of the Comet to sink the Discovery shaft, which has attained a depth of eighty feet, fifty feet deeper. The shaft at present is in a large body of ore. Work is being actively prosecuted on the Ferry lode, Republican mountain. A shaft has been sunk to the depth of seventy-five feet, and a drift is now being run to the east, which drift now thirty-five feet in length; the breast of the drift nowdiscloses a large body of gangue filled with mineral. It is quite probable that the mine is now in good pay. Good pay has been struck in the Ocean Wave, Leavenworth mountain. The lode was discovered on the banks of the creek, and a level is being run in on the vein. The mine now discloses about eight inches "high-toned" ore, which will certainly run $500, coin, to the ton. The Diamond Drill Company have taken a contract to run a tunnel into Hiawatha mountain, Morris district, a distance of 2,130 feet, for which they are to receive $18 a foot. The tunnel is also to be seven by eight feet. May success attend them. We shall look upon this tunnel, if it is started as proposed, to be the final test of the merits and demerits of the diamond drill. The reduction works want ore, and the miners want lower rates of treatment. We earnestly hope that the two wants will be fruitful in giving to the district a more economical price for treating ore, thereby rendering a lower grade available, and bullion shipments larger and more regular. Work is being actively carried on in the Junction lode, Democrat mountain, with most excellent success. An adit has been driven in on the vein 220 feet in length, the end of which has just penetrated an ore-chimney. The crevice of the lode is eight feet in width, and the pay-vein is eight inches thick, consisting of sulphurets of silver and galena. Assays as high as $7,500 per ton have been obtained from selected specimens, while the pay-vein will average 500 ounces per ton. Samples of the ore found in the Bason lode, Sherman mountain, the cutting of which by a tunnel was mentioned lately, have been assayed. The ore runs at the rate of $440, coin, per ton. A very fine specimen of native silver from the Chashier lode, was lately shown by LEVI MARSHALL. The silver was in a bunch of minute wire, and made a fine appearance when contrasted with the mineral and gangue. FILLIUS & SITES, who are working the east end of the O. K. lode, report the mine as looking very well. They have been timbering the shaft, which is now about eighteen feet deep, and will soon resume sinking. A new discovery has been made on Leavenworth mountain, by WILLIAMS & WALKER. It has been called the Simpson lode. The vein shows a good crevice, and carries from three to four inches of good mineral. A contract has been let to drive the adit on the Big Indian lode, Burril mountain, a further distances of fifty-five feet into the mountain. The Big Indian is one of the largest and best-defined lodes in the Montana district. Some three or four inches of rich ore have been struck in the Washington lode, Leavenworth mountain, by G. A. WILLIAMS. The shaft is now about forty feet in depth, and the ore-veins keep improving. The mineral assays from 600 to 800 ounces per ton. The Dives lode continue to do well. The last lot of ore treated, two and a-half tons, ran at the rate of $140, coin, per ton. This ore was obtained in sinking the shaft, which is now about forty feet deep. The ore is increasing in richness as depth is gained in the shaft.

California.

SURVEY OF PLACER CLAIMS.

The following letter gives a very liberal rule for the survey and subdivision of ten-acre lots of mineral lands, and will be readily understood by surveyors and miners. The particular value is in the surveying of creeks and canyon claims. The case which called for the ruling arose on Deer Creek, just below Nevada City:

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE, Oct. 20th, 1870.

HON. A. A. SARGENT, Washington City—Sir: In reply to your letter of the 31st August last, covering one from H. S. BRADLEY, a Deputy United States Surveyor, dated the 13th of the same month and year, and addressed to yourself, I have the honor to state as follows:

Circular instructions were issued to the United States Land Officers by this office on the 8th August last, in relation to the survey and entry of lode and placer claims under the provisions of the amendatory act of Congress, granting the right of way to ditch and canal owners over the public lands, and approved July 9th, 1870, a copy of which is herewith inclosed.

It will be perceived on the first page of the circular, that Surveyors-General were authorized to have the subdivision of forty-acre legal subdivisions into ten-acre tracts made when applied for by claimants, and at their cost; and under the twenty-third head of the same circular, the Land Officers were informed that placer claimants desiring the subdivision of a quarter section, the service may be performed by county and local surveyors, at the expense of the claimant, as required by the sixteenth section of the amendatory law. As to the particular method of subdividing subdivisions into ten-acre lots, I have to observe that they are susceptible of being subdivided either into square lots of ten by ten chains, or into lots of five by twenty chains, by running, measuring and marking lines in the field due east and west, or due north and south, through the legal subdivisions desired to be subdivided into ten-acre lots, and in regard to which method the Surveyors-General have this day been instructed.

I am, very respectfully, your obedient servant,
JOS. S. WILSON, Commissioner.

DIAMOND DRILL IN GRAVEL MINE.

A Grass Valley paper says: "Mr. MALTMAN, of the firm of MARCELUS & MALTMAN, extensive miners of Nevada City, informs us that he regards the diamond drill as the greatest adjunct to rapid prospecting in the gravel hills that has yet been discovered. The drill goes through the hardest granite of MARCELUS & MALTMAN'S claims with great rapidity. We saw the "core" which such a drill took out of a block of that granite, and we are satisfied that it is very hard. The core is in the cabinet of Mr. IRA A. EATON, Union Hotel, Nevada. The stone which was drilled was taken to San Francisco for the purpose. We believe that arrangements are being made by Mr. MALTMAN to have one of the machines brought to this county for prospecting purposes."

EMPIRE MINE.

The Grass Valley *Union*, November 7, says: "In spite of wind and weather, the reconstruction of the Empire works goes on. The hoisting works have the engine at work, and are covered in. Work for the mill building is now being done under a large shed which protects the workmen. Wood is being hauled to the mine, and in a few days there will be a full winter's supply on hand. The water in the mine has climbed up very slowly, and it will not be above the fifth level before the pump commences work."

NORTH STAR MINE.

Monday last Mr. HOYT, superintendent of the North Star mine, shipped to San Francisco the sum of $18,000 worth of gold. This sum was the proceeds of the mill since the 16th of October last. The North Star mine, under careful management, is proving itself a valuable property.

ALPINE COUNTY MINE.

The Alpine *Monitor*, February 5, thus reviews the mining situation in its locality: "Without intending to disparage any of the thousand and one claims which at one time or another have been favorably looked upon, and which are yet considered safe fields for investment by those interested, we will at this time call attention to a few mines which are, we might say, out of the wilderness of doubt, and only need that the course of present development be followed up energetically to ensure an early change in each from "calling" to dividend-paying mines. The Leviathan has ore enough in sight to pay the owners back even the large amount invested, at the price it commands on the dump. The lower tunnel is in now far enough to connect by winze with the ore deposit above, and will undoubtedly open up a very large additional body of fine ore before spring. The Morning Star has a good body of ore at hand, but the present owners don't seem to know what to do with it, and will probably sell out to those who will make it useful. The Schenectady mine will soon have their connecting shaft between upper and lower works finished, and then the various ore chutes now known to exist will be followed up, and ore sufficient to build a mill for placed on the dump without delay. The Monitor and Northwestern and Silver Glance Companies, owning ground on the Tarshish adjoining the Schenectady, have each large bodies of low grade ore in sight, and are vigorously running for the richer deposits, indicated both by the croppings and bearings from the older mine adjoining. Across the creek and upon the continuation of this great Tarshish lode, the Globe Company have a low-grade ore which is considered of value sufficient to justify a mill, and vigorous efforts are being made to reach a chimney of ore of better character deeper under the mountain. This company have been very fortunate in securing the services of Mr. S. F. AMBDER, who, besides a scientific knowledge of mining and metallurgical matters, brings large experience to the direction of the erection and working of the mill, particularly that it may reduce with profit our peculiar low-grade ores, such vast quantities of which are to be found hereabouts. Across the river, almost in a line southwest from the Leviathan through the other mines mentioned, is the Exchequer mine, which is turning out ore, and for which a mill is now being completed.

"Many more enterprises now suspended will be resumed with flattering prospects as soon as one or more of those above mentioned shall turn out bullion, thus giving courage to the faint-hearted owners to venture their money in further explorations."

Idaho.

NOTES ON THE OWYHEE MINES AND MILLS.

The Owyhee *Avalanche*, Nov. 5, has the following notes on the mines and mills of Owyhee: "Seven steam quartz mills are now at work nearly all the time in Owyhee—the Ida Elmore, Owyhee, Cosmos, Webfoot, Shoenbar, Minear, and BLACK'S mill in Flint. There are also two arrastrars grinding away night and day, and the mill at Fairview will soon be ready to run. Ten bullion producing establishments are not bad to contemplate for a little out-of-the-way camp like this. We visited the Illinois Central mine a couple of days ago, and found the proprietors, SANDS & Co., still taking out fine-looking ore. The average width of the vein is fifteen inches—in some places much wider. The castings are smooth and well defined. They have stoped out the ore for a distance of thirty feet south of the shaft, between thirty and forty feet deep, and have on the dump and at the Minear mill about one hundred tons. We predict a handsome dividend to the lucky owners. A new ledge called the 'Belgium' has recently been discovered, in which are interested J. SCHMIDT, SAM. BEAGLE, and others. It is situated below the road, a short distance east of the Oro Fino, and is about eight inches in width. One assay of the ore yielded $892 per ton—$60 in gold and the remainder silver. Another assay of average rock, pounded up in a mortar, yielded a fraction over $600 per ton. Parties are at work sinking on the vein, and the Belgium bids fair to rank high among the rich mines of our camp. Work on the Red mountain still progresses, and the ore is being worked at the Webfoot mill. A three-foot ledge of splendid-looking ore has recently been struck in the Mahogany mine, and PETE NICK is driving ahead his contract. The Skookum boys are actively engaged in working their ore—some of it at their own arrastrar, and some at the Minear mill. The Oro Fino is now clear of water, the timbering of the shaft is being repaired, and there will soon be lively operations thereabouts. Superintendent HYDE, of the Peek and Porter, is having a splendid ore house erected, and the place graded, and the timbers on the ground for the hoisting works. Mr. PECK has had a few tons of Belle Peck ore crushed at Mr. TRASK'S arrastrar. We have not been informed of the yield, but will wager that it panned out handsomely. TRASK'S arrastrar is running on a batch of ore from the Wild Dutchman mine. A contract has been let to sink the main shaft of the Ida Elmore one hundred feet deeper, and a rich and extensive strike is expected. The Charlot continues rich as ever, and the stock has gone up to $60 per share.

Montana.

SILVER STAR, RADERSBURG.

A correspondent of the *Gazette* of the 1st, at Silver Star, writes as follows: "The quartz interests here are in a flourishing condition. The Everett Green Campbell Company's mill is in constant operation upon the superior quartz of the ever-reliable Green Campbell, which is yielding an over abundant supply, and much satisfactory work is in rapid progress upon other lodes in the district. Verily, Silver Star is destined to control an enviable position in the records and statistics of Montana's mineral productions, and I doubt not but that the surrounding valley will well keep pace with it in the final exhibit of stock raised and agricultural products."

From the *Herald* of the 2d we learn that just now there is an unusual excitement at and around Radersburg over quartz. A number of gold ledges, newly discovered and demonstrated to be very rich, have been opened and are being pushed to further development. Quite a stampede within the past few days has taken place from the Boulder country to Radersburg, and more are preparing to follow.

BEARTOWN.

According to the *Independent* of the 5th inst., mining operations are going on as usual, though the late cold weather materially diminished the amount of water. Work will be carried on all winter in nearly every claim for a distance of three miles below town. Messrs. LAFFORCAD & COROLET have purchased the house formerly kept by ERRICK, and are carrying on the restaurant business in first-class style. JOAQUIN ABASCAL & Co. are doing a brisk jobbing business in furnishing miners with winter supplies. MANTON & HOGAN have opened a store in the building formerly occupied by LEE & O'CONNELL. SMITH & WHYTE have purchased the old billiard saloon of JNO. MANNING. Mr. VAN GUNDY has bought the old ball house of SMITH & Co., and will make a billiard hall of it. FOLEY & ST. JOHN, at First Chance, picked up $128 in nuggets one day last week while cleaning bedrock. ST. JOHN, who was severely injured by the caving of a bank about four weeks ago, is now able to walk about.

MARKET REVIEW.

The Coal Trade.

NEW YORK, Nov. 18, 1870.

WHOLESALE.—We have but little change to note in the trade this week. The standard Coals are selling at their full circular rates. The prices are very low, and dealers throughout the country generally are taking advantage of the present extremely low prices, and are filling up for winter supplies. In this they act wisely in our judgment, as, should the winter prove a severe one—and the chances are all in favor of a cold winter—the Coal will all be wanted. Even if the winter proves to be similar to the last one, we very much question if prices next March will be any lower than they are at present, hence our advice to dealers and consumers is to buy freely now. Schuylkill Coal has been selling at very irregular prices during the past week. This Coal has been pressed upon this market in very large quantities, and we hear sales made of "cargoes afloat" at $5 for Egg and Stove; $4 50 to $4 75 for Egg in entire cargoes. These are ruinous rates; operators are stopping as a consequence, and we look for a complete cessation of shipments from the Schuylkill region on or before the 1st proximo. The Delaware and Hudson Canal is interrupted again by reason of low water, and the tonnage by that avenue for the balance of the season will be largely curtailed.

RETAIL.—Dealers are doing a very active business. We have no change to note in quotations.

FREIGHTS.—Vessels are in moderate supply and freights are unchanged.

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Nov. 12, 1870, compared with week ending Nov. 13, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
*Phila. & Reading R.R.	111,455	3,102,378	97,776	2,750,937
Schuylkill Canal	11,459	596,589	28,079	546,589
Lehigh Valley R. R.	54,979	1,678,405	59,512	2,691,535
Lehigh & Sus. R. R.	33,631	739,340	34,127	910,698
Lehigh Canal	....	583,284	31,989	708,750
Scranton North	16,491	372,804	9,937	635,682
" South	24,778	846,630	43,350	1,546,630
Penn. Coal Co., rail	10 247	831,468	22,934	1,017,028
" " canal	476	17,275	1,114	16,256
Del. & Hud. Canal Co.	51,498	1,367,277	43,694	1,257,328
" " R. R.	3,325	131,620	15,410	445,180
" " south	5,575	107,813	8,695	399,526
Shamokin	16,160	473,316	10,224	426,07.
Trevorton	1,730	30,353	....	67,371
Lykens Valley Coal Co.	3,057	68,477	6,947	143,713
Wyoming South	12,680	288,128	10,949	305,855
Wyoming North	4,203	70,471	....	....
P. N. Y. C. & R. R. Co.	....	....	5,129	262,631
Williamstown, Co'y	6,802	174,838	6,682	261,836
Short Mountain	2,441	95,478	....	....
Big Lick Colliery	....	....	....	....
Total	374,907	11,436,270	425,568	14,436,737
1869	....	....	374,907	11,436,270
Increase week and year.	....	....	....	3,000,467

* Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Nov. 12, 1870, compared with week ending Nov. 13, 1869.

COMPANIES.	1869. Week.	1869. Year.	1870. Week.	1870. Year.
B. & O. R. R.	....	847,000	19,903	889,551
C. & O. Canal	....	536,000	24,908	*549,450
H. & B. T. R. R.	8,084	313,105	7,054	270,013
Harrisburg & D.	14,762	....	13,255	644,555
L. V. R. R.	2,808	14,691	....	12,213
P. & N.Y.C. & R. Co.	....	....	5,407	228 627

Philadelphia and Reading R. R

Amount of coal transported on the Philadelphia and Reading Railroad for the week ending Thursday, Nov. 10, 1870:

From St. Clair	33,579 08
" Port Carbon	8,473 03
" Pottsville	5,041 12
" Schuylkill Haven	28,350 10
" Auburn	6,227 18
" Port Clinton	15,885 01
" Allentown and Alburtis	219 01
" Harrisburgh and Dauphin	13,255 11
Total paying freight	111,032 04
Coal for Company's use	3,711 13
Total for week	114,743 17
Previously this year	3,367,554 09
Total	3,482,298 06
To same time last year	3,879,186 19

Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Thursday, November 10, 1870.

	Tons. Cwt.
From Port Carbon	— —
" Pottsville	— —
" Schuylkill Haven	28,713 15
" Port Clinton	1,366 00
Total for week	28,079 15
Previously this year	416,943 05
Total	445,023 00
To same time last year	596,5c9 05

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via. the Pennsylvania and New York Canal and Railroad Company, for week ending Nov. 15, 1870:

	WEEK.	PREVIOUSLY.	TOTAL.
Anthracite	5,129 16	257,561 16	262,691 12
Bituminous	5,407 00	2 3 220 00	2 8,627 00
Total, Ant. and Bit.	10,536 16	480,781 16	491,318 12

Delaware, Lackawanna, and Western Railroad.

COAL Transported for the week ending Saturday, November 12, 1870.

	WEEK. tons. cwt.	YEAR. tons. cwt.
Shipped North	9,937 09	635,682 28
Shipped South	43,350 08	1,556,630 01
Total	33,287 17	2,192,312 01
For the corresponding time last year,		
Shipped North	16 491 09	372,802 03
Shipped South	26,778 04	686,656 01
Total	45,269 13	1,259,463 04
Increase	8,018 04	932,851 17
Decrease		

Lykens Valley Coal Trade.

Shipment of Coal for the week ending Nov. 12, 1870.

For week	6,947 13
Same time last year	3,067 16
Increase	3 879 17
For year	143,713 17
Same time last year	68,677 06
Increase	75,03[illegible]11

Report of Coal Transported over Lehigh Valley Railroad

For the week ending November 12, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	PREV'LY. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	11,464 06	547,983 11	559,447 17
" Hazleton	44,601 16	1,868,036 01	1,912,637 17
" Upper Lehigh	98 03	11,797 02	11,895 02
" Beaver Meadow	13,576 17	659,867 03	673,5.4 00
" Mahanoy	10,563 00	260,241 17	270,804 17
" Mauch Chunk	256 03	1,518 04	1,773 07
Total Anthracite	80,501 02	3,349,553 18	3,430,055 00
Bituminous Coal recv'd from Cata. R. R.			
N. C. R. R.			
E. P. R. R.		12,213 00	12,213 00
P. & N.Y. C. & R.R. Co			
Fall Creek			
Schroeder			
Towanda			
Total by rail and canal	80,501 02	3,361,746 18	3,442,248 00
Same time last year	60,844 11	2,115,577 02	2,176,421 13
Increase	19,656 11	1,246,169 16	1,265,826 07
Decrease			
Forwarded East from M'h Chunk by rail	59,512 04	2,622,022 17	2,681,535 01
Same time last year	54,979 08	1,823,475 16	1,878,406 04
Increase	4,582 16	798,547 01	803,129 17
Decrease			

RECAPITULATION.

Forwarded East from M'h Chunk by rail	59,512 04	2,622,022 17	2,681 535 01
To N. C. R. R., at Mount Carmel		3,423 15	3,423 15
Forwarded North from L. & B. Junction	5,129 16	257,035 10	262,165 06
To L. & S. R. R. at Packerton for rail	332 05	7,689 05	8,021 10
Delivered at M'h Chunk	138 08	1,364 19	1,497 07
Delivered on line of road above Mauch Chunk	439 06	9,804 03	10,213 09
Delivered above M. Chunk for use of L. V.R.R.	231 12	48,299 03	49,130 15
To L. & S. R.R., at P'n Hav., for railroad	9 784 19	268,457 05	278,242 04
Do. for canal	4 3.8 12	131,437 01	135 775 13
At M.Chunk for canal			
Total Anthracite	80,501 02	3,349,533 18	3,430,035 00
Bituminous Coal		12,213 00	12,213 00
Total all kinds	80.501 02	3,361,746 18	3,442,248 00

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending November 12, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons cwt.	WEEK, 1869. tons cwt.	YEAR 1870. tons cwt.	YEAR, 1869. tons cwt.
Wyoming Region	31461 00	20179 13	1084745 09	703876 09
Upper Lehigh Region	3519 18		152465 02	77488 03
Mahanoy Region	186 00		2397 15	2531 01
Hazleton Region	10169 01	31 16	287760 02	121767 14
Beaver Meadow Region	4212 09		136875 07	93639 11
Mauch Chunk Region	12478 07	14453 06	193189 01	376615 09
Totals	62026 15	34664 15	1835432 16	1375718 07
Increase	27362 00		459714 09	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	24127 04	33631 09	910688 14	739390 15
Forwarded East of Mch Chunk by Canal	30969 07		708750 17	583284 04
Delivered at and above Mauch Chunk	1161 08	819 08	36285 11	30208 18
Delivered to L. & B. R. R.at Plymouth Bridge	5768 16	213 18	176707 14	17683 07
L. V. R. R. at Sugar N.				5151 03
Totals	62026 15	34664 15	1835432 16	1375718 07
Of the above there was transported on acc'nt of L. C. & N. Co.	14474 06	15468 12	233576 10	404776 11
W.-B. C. & I. Co.	15913 00	10128 00	532075 10	362063 10
Totals	30387 06	25596 12	765652 00	756840 01
Increase	4790 14		9811 19	
Decrease				

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, November 12, 1870.

	WEEK.	SEASON.
North	45,656 10	1,844,149 15
South	8,695 13	399,5.6 02
Total	54,352 03	2,243,675 17
CORRESPONDING TIME IN 1869:		
North	45,035 05	1,155,707 05
South	5,574 19	106,098 08
Total	50,600 04	1,261,833 13
Increase North	631 05	Inc. 688,412 10
Increase South	3,120 14	Inc. 293,429 14
Total Increase	3,751 19	Inc. 981,842 04

The following is a statement of coal transported by the Delaware and Hudson Canal Company, for the week ending November 12, 1870.

	WEEK.	SEASON.
By Del. and Hud. Canal	43,694 00	1,257,328 00
By Railroad	15,410 00	445,180 00
South	8,695 00	399,526 00
Total	67,799 00	2,102,034 00
By Jefferson R.R.	1,962 00	3,863 00
Corresponding time in 1869.	69,761 00	2,105,897 00
By Del. and Hud. Canal	51,498 00	1,057,277 00
By Railroad	3,325 00	131,620 00
South	5,575 00	107 813 00
Total	60,398 00	1,296,710 00
Increase	809,187 00	

Summit Branch Railroad Company.

The following is the quantity of Coal shipped from Williamstown Colliery, for week ending Saturday, November 12, 1870

	6,852 07
Same time last year	6,802 06
Decrease, Tons	149.19
Total amount shipped to date	284,836 03
Same time last year	174,838 06
Increase, Tons	89,997 17

Pennsylvania Coal Company,

Shipments of Pittston Coal for the week ending Nov. 12, 1870.

	1870. WEEK.	1870. YEAR.	1869. WEEK.	1869. YEAR.
By Railway	22,934 13	1,007 038 02	10,277 07	831,468 12
" Canal	1,194 06	16,256 00	476 11	17,275 18
Total	24,128 19	1,023,354 02	10,753 18	848,744 10
Increase, 1870, 174,609 12 tons.				

Harrisburgh and Dauphin Coal Trade.

The following is the amount of Bituminous Coal transported via the P. and R. R. for the week ending Nov. 10 1870:

	Tons.
For week	12,256 11
Previously this year	644,300 02
Total	657,555 13
Same week last year	14,762 19

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

Prices for Coal at Mauch Chunk.

November 1870.

	F.L.	Bro.	Gra.	Eg.	Sto.	Chest.
Lehigh	$3 00	$3 75	$3 75	$3 75	$4 00	$3 00
Wilkesbarre	3 00	3 75	3 75	3 75	4 00	3 00

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein...f.o.b. at Phila.	$5 00
Lemon " " "	4 75
Cumberland Vein Coal	4 75
Consolidation Coal Co.'s on board N. Y.	7 00
Maryland Coal Co. "	7 00

AT NEW YORK, November 19. SCHUYLKILL.	R. A.	W. A.	AT PHILADELPHIA, November 18. R. A.	W. A.
Lump	$— —	$5 00	4 75	4 50
Steamer	— —	5 00	— —	4 50
Broken	— —	5 50	— —	4 50 to 4 75
Egg	5 50 to 6 00	5 25 to 5 50	— —	4 50 to 4 75
Stove	5 50 to 6 00	5 50 5 75	— —	4 50 to 4 75
Chestnut	4 00 to 4 50	4 00 4 25	— —	4 25 to — —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	5 00	— —	— —	— —
Broken	5 25	— —	— —	— —
Egg	5 25	— —	— —	— —
Stove	5 25	— —	— —	— —
Chestnut	4 00	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A.	6 00	— —	— —
New England	"	— —	— —	— —
Locust Dale	W. A.	5 75	— —	— —
Honey Brook, Le'h	W. A.	4 25 to 5 25	— —	— —
Spring Mountain	" "	4 25 to 5 25	— —	— —
Sugar Creek	" "	4 25 to 5 25	— —	— —
Sugar Loaf	" "	4 25 to 5 25	— —	— —
Old Comp'y's	" "	4 25 to 5 25	— —	— —
Cross Creek	" "	4 25 to 5 25	— —	— —
Room Run	" "	— —	— —	— —
Girardville	" "	— —	— —	4 75
McMichael	" "	— —	— —	4 75
Shamokin	" "	5 50	5 25	— —
Lykens Valley	" "	— —	5 75	— —
Broad Top	" "	5 50	— —	— —
Hill & Harris	" "	— —	4 75	— —
Henry Clay	" "	— —	5 00	— —
Powelton	" "	5 50	— —	4 75

(*Dealers in these coals may be found in our advertising columns.)

Company Coals.

November, 1870.

	L.	Str.	Gra.	Egg.	Sto.	Ches.
Scranton at E. Port	4 25	4 25	4 50	4 50	5 25	4 25
Pittston at Newburgh	4 30	4 30	4 50	4 60	4 90	4 20
Lackawana at Rondout	4 25	4 25	4 40	4 60	5 10	4 30
Wilk'b're at Hoboken	4 00	4 25	4 50	4 65	5 25	4 10
Old Co. Lehigh at Pt. Johnston	5 25	5 00	5 00	5 50	4 25	— —
Lehigh at E. Port	5 25	— —	5 00	5 00	5 50	4 25

For freights to different points, see "Freights."

Prices at Baltimore—November, 1870.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 80@— —
Pittston and Plymouth, do	5 60@5 75
Shamokin Red or White Ash, do	— —@6 00
Lykens Valley Red Ash, do	5 25@— —
Zerba Valley	5 25@— —
Treverton	6 00@— —
By retail, all kinds per ton of 2240 lbs.	7 25@8 25
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 60@4 75
Fairmont and Clarksburg gas, f. o. b. at L. Point	6 00@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

November, 1870.

George's Creek and Cumberland f. o. b. for shipping..$4 40

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@5 50
Lykens Valley	— —@6 25
Shamokin Red or White Ash	— —@5 75
Trevorton and Zerba Valley	— —@6 00

Prices of Gas Coals.

November, 1870.

PROVINCIAL.

Corrected weekly by Louis J. Bellon, Jr. 41-43 Pine st., N.Y.

	Duty, $1 25, gold.	Coarse.	Slack.
Block House		$1 75	@- 75
Gowrie		1 75	@- 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25	@1 25
Sydney	2 25	@- 80
Lingan	1 75	@- 80
Little Glace Bay	1 75	@1 00
Caledonia	1 60	@- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Currency.
Westmoreland	7 75 @8 00
Fairmount Gas Coal Co. of N. Y.	7 50 @— —
Despard Coal Co	$7 50 @— —
Penn	7 75 @8 00
Newburg Orrel Gas	— — @— —
West Fairmount Gas Coal	8 00 @— —

AT PHILADELPHIA.

Powelton	$7 80

Prices of Foreign Coals.

November, 1870.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, New York.

Liverpool Gas Caking	$ 9 00@— —
" " Cannel	11 50@12 50
" House "	— —@16 00
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs. delivered

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Port Carbon	$2 00
Less drawback of 50 cents on all Coal shipped east of New Brunswick and south of Cape Henry.	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 75½
C. R. R., N. J., Easton to Elizabethport	1 08
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 18

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 75
C. R. R., of N. J., Easton to Pt. Johnson	1 11
Shipping expenses	25
Warfage	10
Total	$2 22

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 75
Morris & Essex R. R. Easton to Hoboken	1 11
Shipping expenses	25
Warfage	10
Total	$2 22

TO SOUTH AMBOY.

L. V. R. R.	75
B. & D. R. R. / Cam. & Am. R. R.	1 02
Shipping Expenses	25
Total	$2 02

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	75
C. RR. of N. J. Easton to Elizabethport	1 08
Shipping expenses	25
Wharfage	10
Total	$2 1

BY CANAL.

Via Schuylkill Canal.

TO PHILADELPHIA.

From Schuylkill Haven	$1 07
" Port Carbon	1 10
" Port Clinton	1 00

TO NEW YORK.

From Schuylkill Haven	$1 70

Via Lehigh Canal.

TO PHILADELPHIA.

Lehigh Canal	$0 70
Freight and towage	1 07
Total	$1 77

TO NEW YORK.

Lehigh Canal	$ 40
Morris " / Freight, Towing	2 10
Total	$ 2,50

TO JERSEY CITY.

Lehigh Canal	$ 40
Morris " / Freight	2 05
	2 45
For re-shipment	2 19

Via Delaware and Raritan Canal.

TO NEW YORK.

Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	25
Freight	1,25
Towage	20

TO NEW BRUNSWICK.

Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	35
Freight	1 05
Total	$ 2,10

For Re-shipment—30 extra for shipping, less 10 cents. drawback.

Towing Rates.

TO EASTERN PORTS.

	Per Ton.
To New Haven	$ 40
Bridgeport	40
Southport	40
Westport	40
Norwalk	40
Stamford	40
	Per Boat.
Greenwich	$70 00
Port Chester	80 00
Mamaroneck	70 00
Glen Cove	60 00
New Rochelle	55 00
East Chester	60 00
West Chester	30 00
White Stone	30 00
College Point	25 00
West Farms	25 00
Flushing	30 00
Harlem and Mott Haven	20 00
Port Morris	20 00
Ninety-first street and Astoria	16 00

Boats beyond Port Chester, with less than 200 tons, $80 per Boat.

TO RIVER PORTS

Boats of 150—250 Tons.	Per Ton. 8 cents
To Manhattanville	8 "
Spuyten Duyvil	9 "
Yonkers	10 "
Hastings	12 "
Piermont	12 "
Dobbs' Ferry	14 "
Nyack	15 "
Tarrytown	16 "
Sing Sing	17 "
Croton Landing	17 "
Haverstraw	17 "
Verplanck's	18 "
Peekskill	20 "
West Point	20 "
Cold Spring	18 "
Newburgh	22 "
Poughkeepsie	23 "
Rondout	

Boats of 100 Tons	Per Boat
To Manhattanville, and Return	$11 00
Spuyten Duyvil	13 00
Yonkers	15 00
Sing Sing	20 00
Peekskill	25 00

Freights.—NOVEMBER, 1870.

TO EASTERN PORTS.	From Philadel'a.	From E. Port and Port Johnston.	From Newburg	From Rondout
Amesbury	$2 50	$2 00	$	$
Bangor	2 30	1 60	1 60	
Bath	2 30	1 75	— —	
Boston	2 30	1 75	2 25	1 90
Bridgeport	1 75	1 00	1 10	1 20
Bristol	2 00	1 40	1 40	
Cambridgeport	2 35	2 00		
Derby	2 00	1 20		
Dighton	2 30	— —	1 45	
East Cambridge	2 35	2 00		
Fall River	2 40	1 40	1 40	
Hackensack	1 75	1 00		
Hartford	2 50	1 50		
Jersey City	1 35	60		
Middletown	2 25	1 25		
Mystic	— —	1 25	1 30	
New Bedford	2 00	1 40		
Newburyport	2 50	1 85		
New Haven	1 90	1 00	1 10	1 20
New London	2 00	1 25	1 25	1 30
Newport	2 00	1 40	1 40	
New York	1 35	60	70	
Norwalk	1 90	1 00	1 05	
Norwich	2 00	1 30	1 35	1 40
Pawtucket	2 30	1 50	1 60	
Portland	2 25	1 50		
Portsmouth, N. H.	2 25	1 85		1 85
Providence	2 00	1 40	1 45	1 45
Rockport	1 75	1 00		
Saco	2 25	1 75		
Sag Harbor	1 70	1 20	1 30	
Salem	2 25	1 65	2 25	21 5
Stamford	2 00	1 00	1 00	
Stonington	2 00	1 30	1 25	
Taunton	2 30	1 75		
Warren	1 25	1 40	1 45	
Washington				
TO RIVER PORTS.				
Albany		90	- 60	
Catskill		— —	- 50	
Cocksackie		— —	- 50	
Coeyman's		— —	- 75	
Cold Spring		— —	- 35	
Fishkill		— —	- 30	
Haverstraw		50	- 60	
Hudson		— —	- 50	
New York		— —	- 70	
Nyack		60	- 60	
Poughkeepsie		— —	- 35	
Rhinebeck		— —	- 30	
Rondout		— —	— —	
Saugerties		— —	- 40	
Sing Sing		— —	- 75	
Stuyvesant		— —	- 55	
Tarrytown		80	- 75	
Troy		90	- 75	
West Point		— —	- 35	
Yonkers		40	- 60	

Foreign and Provincial Freights.

November, 1870.

Foreign.	
Newcastle and Ports on Tyne, per keel of 21 1-5 tons	£14 00@£16 00
Liverpool, 5 per cent primage	13s @16. ton
TO NEW YORK.	
Provincial	
Sidney	$3 00
Lingan	3 00
Cow Bay	—
Port Caledonia	3 25
Little Glace Bay	3 00
TO BOSTON.	
Sydney	$2 75
Lingan	2 75
Cow Bay	—
Port Caledonia	3 00
Little Glace Bay	2 75

METALS.

NEW YORK, November 17, 1870.

IRON.—Duty: Bars, 1 to 1¼ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1½ cents ₱ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₱ lb; Pig, 9 ₱ ton; Polished Sheet, 3 cents ₱ lb.

	Store Prices.
Pig, Scotch No. 1, ₱ ton	— —@36 00
Pig, American, No. 1	— —@31 00
Pig, American, No. 2	— —@30 00
Pig, American, Forge	27 00@29 00
Bar, Refined, English and American	— —@75 00
Bar, Swedes, assorted sizes (gold)	85 00@100 0
	Store Prices, Cash 0
Bar, Swedes, ord'y sizes, less 5 ₱ ct.	— —@110 00
Bar, Refined	80 —@ 85 00
Bar, Common	75 00@ 80 00
Scroll	97 50@120 —
Ovals and half-round	100 —@125 —
Band	95 —@ — —
Horse Shoe	95 —@ — —
Rods, ¾ to 3-16 inch	85 —@120 —
Hoop	105 —@130 —
Nail rod, less 5 ₱ ct.	— 7@— 7½
Sheet, Russia, as to Nos. (gold)	11 @—11½
Sheet, Single, D. and T. Common	4¾@— 6
Sheet, Galv'd, Nos. 14 to 26 10 and 12c. Nos. 27, 28, and 29, 13@14	
Rails, English (gold), ₱ ton	67 00 @69 00
Rails, American, at Works in Pa	70 00 @71 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ₱ ₱ or under, 2½ cents; over 7 cents and not above 11, 3 centsore ₱; over 11 cents, 2½ cents ₱ lb. and 10 ₱ cent ad val. (St prices.)

English Cast (2d and 1st quality) ₱ ₱	— 15	@— 18
English Spring (2d and 1st quality)	— 7	@— 10
English Blister (2d and 1st quality)	— 10	@— 17
English Machinery	— 11½	@— 14
English German (2d and 1st quality)	— 13	@— 15
American Blister "Black Diamond"	— —	@— 12
American, Cast, Tool do.	— —	@— 17
American, Spring, do.	— 9	@— 11
American Machinery, do.	— —	@— 13
American German, do.	— 9	@— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	@— 30
Copper Bolts	@— 32
Copper Braziers, 16oz. and over	@— 32
Copper Nails	@— 37
Copper, Old Sheathing, &c., clean	@— 19
Copper, Chili Pig	@— —
Copper, American Ingot	22¼@22¾
Yellow Metal, New Sheating	@— 22
Yellow Metal Bolts	@— —
Yellow Metal Nails	@— 22

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1½ cents ℔ lb: Pipe and Sheet, 2½ cents ℔ lb.

Galena, ℔ 100 lbs	$— @— —
Spanish (gold)	6 25 @6 37½
German, do.	6 25 @6 37½
English, do.	6 25 @6 62½
Bar	7 50 @— —
Pipe (net)	7 50 @— —
Sheet	8 00 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.: Plate and Sheets and Terne Plates, 25 ℔ cent. ad val.

	Gold ℔ lb.
Banca	— @31½
Straits	31 @31½
English	31 @31½

PLATES.

Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ℔ box	$8 25 @8 87½	$9 75 @10 25
I. C. Coke	7 25 @8 —	8 50 @ 9 50
Coke Terne	5 65 @6 75	6 75 @ 7 75
Charcoal Terne	7 50 @8 —	9 00 @ 9 50

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ℔ 100 lb

	Gold.
Plates, Foreign ℔ 100 lbs.	$6 00 @ 6 12½
Plates, Domestic ℔ lb.	7 1-16@- 11½

REMARKS.

IRON.—Scotch Pig continues in demand, but as there have been no receipts since our last, the stock is almost entirely exhausted, and transactions are confined to a few small parcels at slightly advanced rates. The sales are 50 tons Summerlee at $35 40 do. Glengarnock, $35, both from yard, and 100 do. same, to arrive, $34. There has been a little more inquiry for American, but at lower prices; 500 tons No. 1 Allentown sold on private terms, the market closing at $31 for No. 1, and $30 for No. 2, with but little disposition to purchase at these figures. There has been little demand for either Old or New Rails, but prices are unchanged, 130 tons Old Car Wheels sold at $36 50 at Jersey City.

TIN.—The market for Pig is stil very dull, and prices are irregular, though the general tendency is rather in the buyer's favor. We have only to notice sales of 200 slabs Straits at 31 a 31½c., and 5 tons English at $1. Banca nominally $35½c., all gold. Plates have sold a little more freely, but there is no general activity; prices are without quotable change. Sales have been made of 750 bxs. assorted Charcoal Tin at $8 75 for I. C., 500 do. Charcoal Terne, $7 50 @ 7 75, both gold; and 750 do. on terms not made public.

COPPER.—The manufactures of Copper and Yellow Metal are steady at our quotations. In Ingot there has been a renewal of the speculative demand, and, with more inquiry from dealers and manufactures, prices harden and close a little higher. The transactions embrace about 750,000 lb. Lake for immediate delivery, commencing at 22½c., and closing at 22½c.; 800,000 lb. at 22½c. for end of December and January delivery, and 23c. for February and March.

LEAD.—The market for Pig was quiet but steady; sales have been made of 50 tons Common Spanish at 6¼c.; and 50 do. Newark, 6¼c., both gold. Bar 7½c., Pipe, 7¼c., and Sheet 8c. One of the manufactures have reduced their prices to 7¼c. for Bar, 7¼c. Pipe, and 7¾c. for Sheet.

SPELTER.—Foreign is still neglected, and our quotations are 6 @ 6¼c., gold, is entirely nominal.

ZINC.—Am. Ox., 6½ @ 7c.; French, 10 @ 11c.; Sheet Zinc, 9¼ @ 10c.; Manganese, 4 @ 4½c.

London Weekly Metal Report.

LONDON, E. C., October 28, 1870.—The Metal Market remains very quiet. The prospect of an armistice, to be succeeded by peace, makes operations more hopeful.

IRON.—Welsh Bars unchanged. Rails decidedly dearer, makers having secured some fair orders. Scotch Pigs steady at 51s. 6d. cash.

COPPER.—The market for Chili is better, and there are buyers of Bars at £63 to £63 10s., according to brand. Australian is now held for £71. India Sheets quoted at £71. Raw obtainable a shade under official rates.

TIN.—Market very flat find inactive. Straits is quoted at £126 to £127, and Banca has been sold to arrive from Holland, for £126 10s. down to £125. English steady. Ingot £128, and Bars £129.

TIN PLATES.—No improvement.

LEAD.—Steady, £18.

SPELTER.—Quite nominal, £17 to £17 10s.

ANTIMONY.—Quoted £59 to £60.

QUICKSILVER.—Advanced to £9 9s. per bottle.—VON DADELSZEN'S & NORTH'S *Report*.

Mining Stocks.

NEW YORK, Nov. 17, 1870.

The following are the quotations issued by the New York Mining Stock Board this day:

GOLD STOCKS.	Bid.	Asked.
Benton Gold	3	7
Black Hawk Gold	20	40
Central Gold	12	17
Consolidated Gregory	50	60
Grass Valley	25	30
La Crosse Gold	8	—
Quartz Hill	12	—
Smith & Parmelee Gold	60	—

PETROLEUM STOCKS.	Nov. 3. Bid.	Nov. 3. Asked.	Nov. 12. Bid.	Nov. 12. Asked.
Blivin Oil	—	—	40	—
Bennehoff	—	—	20	40
Bergen Coal and Oil	—	—	—	40
Blood Farm	—	—	50	—
Brevoort	—	—	60	—
Buchanan Farm	—	—	35	—
Central	—	—	50	60
Home Petroleum	—	—	1 50	—
N. Y. and Alleghany	—	—	1 50	—
National	—	—	—	—
Northern Light	—	—	—	—
Phillips' Pet	—	—	12	—
Pithole Creek	—	—	—	95
Rathbone	—	—	—	—
Rynd Farm	—	—	28	—
Second National	—	—	—	—
United Petroleum Farms	—	—	15	25
United States	—	—	60	75

Prices of Slate in New York.

[Corrected weekly.]

(A "square" represents 100 superficial feet.)

PRICES OF ROOFING SLATE.

Vermont purple, 1st quality, per square	$6 50@ 7 00
" green, 1st " "	6 50@ 7 00
" red, 1st " "	15 00@16 00
" variegated, " "	5 75@ 6 25
Pa. b'k and d'k blue, 1st qual., "	6 00@ 7 00

VERMONT SLATE TRADE.

REPORT of Slate Shipped from Middle Granville, N.Y., via the R. & S. R. R., for the week ending November 12, and for the year 1870.

ROOFING SLATE.

NO. OF SQUARES.	Week.	Prev'ly.	Year.
Penrhyn Slate Co	90	6,150	6,240
New York Slate Co	....	3,070	3,070
Middle Granville Slate Co	95	602	697
*American Slate Co	....	....	....
Benj. Williams	....	1,333	1,333
Jones & Williams	....	140	120
Eagle Slate Co	....	194	194
H. W. Hughes	25	210	235
J. D. Jones	....	....	35
Total	210	11,679	11,924

*Penrhyn and American Co.'s shipments are consolidated for this season.

MANTELS, &C.

NO. OF CASES.	Week.	Prev'ly.	Total.
Eagle Slate Co	.....	.....	.....
Penrhyn Slate Co	48	2,016	2,064

MILL STOCK.

NO. OF CASES SHIPPED BY	Week.	Prev'ly	Total.
Eagle Slate Co. cars	1	23	24
Penrhyn Slate Co	....	....	....

Hydeville, Vt.

REPORT OF SLATE SHIPPED FROM HYDEVILLE, VT., VIA R. & S. RR., FOR THE WEEK ENDING NOVEMBER 12, AND FOR THE YEAR 1870.

ROOFING SLATE.

	WEEK.	PREVIOUSLY.	YEAR.
Eagle Slate Co. sqs.	265	5415	5680
Western Vermont Slate Co	..	26	26
Blue Slate Co	200	772	672
The Evergreen Slate Co	..	4810	4810
Forest Mining Slate Co	..	215	215
West Castleton Slate Co	..	90	90
E. D. Billings	..	263	263
R. M. Copeland	..	143	143
W. E. Williams	..	80	80
Forest Slate Co	..	80	80
Total	465	11894	12359

MILL STOCK.

Eagle Slate Co	24 boxes.
E. A. Billings	1 car load.

FINISHED MANTELS.

West Castleton Slate Co. box.	122	513	635
Forest Mining "	24	322	346
Total	146	835	981

BILLIARD BEDS AND BLACK BOARDS.

Eagle Slate Co. box.	..	1350	1350
West Castleton Slate Co	..	661	661
Western Vermont	23	31	54
E. E. Billings	34	..	34
Total	57	2042	2099

TILE.

Eagle Slate Co. cas.	....	1835	1835
Western Vermont Slate Co	32	....	32

PENNSYLVANIA SLATE TRADE.

SHIPMENTS OF SLATE OVER THE LEHIGH VALLEY, AND LEHIGH AND SUSQUEHANNA R. R., AND THE LEHIGH CANAL:

For the weeks ending Nov. 12, 1870.

LEHIGH VALLEY R. R.

ROOFING SLATE.

Jones & Williams	315 squares.
Locke Slate Co	140 "
Girard Slate Co	140 "
Keystone Slate Co	105 "
Saylor & Morgan	70 "
Kuntz & Woodring	70 "
H. Williams	35 "
D. Williams & Co	35 "
Lehigh Slate Co	35 "
Columbia Slate Co	35 "
Total	980 "

SCHOOL SLATES.

Lehigh Slate Co.	63 cases.
Locke Slate Co	17 "
D. Williams	3 "
Total	83 "

BLACK BOARDS.

Lehigh Slate Co	2 "
Yerkes & Martin	2 "
Total	4

MANTELS.

Lehigh Slate Co	15 "
Yerkes & Martin	9 "
Total	24 "

LEHIGH AND SUSQUEHANNA R. R.

ROOFING SLATE.

Eagle Slate Co	35 squares.
National Slate Co	35 "
Continental Slate Co	21 "
Total	91

SCHOOL SLATE.

A. W. Lerch	22 cases.

	Nov. 12.	Previously.	Total for Year.
L. and S. R. R.	91	9,788	9,879
L. V. R. R.	980	21,027	22,007
Lehigh Canal	..	3,712	3,712
Total	1,071	34,527	35,598

The Struthers Iron Company,

Located at the village of Struthers, Poland township, Mahoning county, Ohio, has been organized for the purpose of acquiring, owning and manufacturing pig metal, railroad bars, and other merchant iron, from iron ore and mineral coal. Capital $400,000, in shares of $10. The corporators are THOMAS STRUTHERS, JOHN STAMBAUGH, JR., THOMAS W. KENNEDY and JOHN STEWART.

Economy of Narrow Gauge Railways.

THE two feet gauge railway in North Wales, constructed for the purpose of transporting slate and stone to the seashore, is now used as a regular goods and passenger line. The traffic, it is asserted, in consequence of the diminished expenses of construction and working, yields a revenue of thirty per cent. on the capital. The reason assigned for this large amount of earnings is, that the proportion between the dead weight and the paying weight is much less than on other railways. Thus, the engine and tender weigh ten tons, against forty tons on wide gauge roads. The carriages on the Welsh road, transporting twelve passengers, weigh thirty hundred weight, or two and a half hundred weight per passenger, while the broad gauge carriages, transporting thirty-two passengers, weigh seven and a half tons, or nearly five hundred weight per passenger. The *London Railway News*, in commenting upon this two feet gauge, asserts that "its economy and efficiency will cause it to be extensively adopted." Why should not this description of railway economy find favor in this country, especially in the construction of branch lines of roadway to points and through regions naturally limited in the amount of their business? We have in mind several instances in which much capital has been sunk in railway construction, not because railways were not important nor needed where built, but because they were constructed at too great a cost for the business at the time to be accommodated. Whereas if roads had been constructed embracing the principles of economy suggested in the "Two Feet Gauge Railway of North Wales," they would not only have paid fairly on the capital invested at the beginning, but have gradually developed the region penetrated, to the great advantage of the neighborhoods as well as to the main lines of railroads from which they branched and were to be tributary. In the immediate vicinity of Philadelphia there are several well-known cases in point. We need but name the Old Chester Valley Railroad, an extension of the Norristown Railroad to Waynesburg, which swallowed all the capital put into it; the Edensburg Road, and the Old West Chester Railroad, branching from the Pennsylvania Railroad, less disastrous perhaps, but both working a similar result. Some trunk lines were guilty of the same error. The North Pennsylvania cost the amount of its funded debt more than it should have done for the amount of business it had at the time and then the near future to accommodate. The withholding of unnecessary capital invested in its construction would have enabled the shareholders to receive dividends steadily from its completion, and the company could have increased its capacity to a gradually developing business. A cheaper road from Camden to Atlantic City than was built would also have shown more wisdom. A dozen others might be mentioned, all demonstrating the same fact, that too much money was expended in advance of the development of business; the mistake being that the roads were made to *create* the business necessary for their support, rather than to accommodate business in freight and passengers already in existence. A branch road from the West Jersey Railroad to Swedesborough, some ten miles long, just put in operation, is another instance in which the cheap principle in railway construction on some similar plan to that mentioned in North Wales might have been advantageously followed. It is contemplated to ultimately extend this branch to various towns five to fifteen miles further South, which, if done on the cheap principle suggested, may not only pay on their immediate lines, but make the branch already constructed pay on its cost. The day, we believe, is not distant when cheap railroads will be as common all over the country as common wagon ways were half a century ago.—*Phil. Ledger.*

India-Rubber in Car Wheels.

MR. ROBERT F. FAIRLIE, of London, famous for his locomotives, has applied for a patent on an appliance described as follows: "The inventor forms the rim and tire of an ordinary railway engine or carriage wheel, of considerable breadth, to receive an india-rubber ring or tire, which must be of sufficient section to sustain the weight brought to bear on it. The metal tire the inventor forms with a small additional flange on the outer edge, to keep the india-rubber tire on the wheel, the ordinary flange being provided at the inner edge, to keep the wheel on the track. He, however, makes the flange of considerably greater depth than usual, as the india-rubber tire, even when compressed on the rail by the weight of the vehicle, occupies a portion of the depth of the flange."

Co-operative Mining.

WE copy the following very sensible remarks from the Central City (Colorado,) *Register:*

"The *Register* has always been the earnest and persistent advocate of co-operative mining. So much has been said that we expect to offer no new ideas upon the subject, but venture a paragraph to say that experience on a small scale has been entirely corroborative of our opinions. The same views are advocated in almost every mining locality, but the plan does not seem to be adopted upon a large scale. In some places it is urged upon the poor men as a defence against the rich, who are crowding them out of the good chances. This is not true here to any extent, but the value of the co-operative system is none the less on that account. Here the principal properties—those which have yielded large returns in the past, and under present rates of supplies will yield a profit again—are owned by a foreign corporation, many of which have had so little success in the past, that they are now willing to lease them upon fair terms. Upon many of these properties considerable work has been done that has not yielded anything. They may have sunk fifty, one hundred, or one hundred and fifty feet in dead ground, and quit it discouraged. Paradoxical as it at first appears, this kind of a mine, if it is upon a lode of known value, is just the mine to lease. Much of the expensive work of timbering and sinking in cap has been done, and often there is required but little more muscle and means to go through to good paying ground. This is the poor man's opportunity. The muscle he has and is willing to use, wherever there is a fair chance of success. Instead of attempting upon his own individual account to work upon some lode that never has produced, let him combine with four, six, a dozen, or twenty men, to lease and go upon some lode of known value, agreeing to work a given time, pay or no pay. For men to do this who are dependent upon their labor for their daily living, it is necessary to embrace in the association men engaged in labor by the day, or others having some surplus means. We are aware that a very considerable portion of the mining done here now is done on this principle, and that it has been more successful than any other plan. But it has been done principally by small parties of from two to six. There appears to be no reason why a larger number, with force enough to take hold of more extensively developed properties, should not combine and work to their full capacity some of our long-neglected mines. We believe it would be alike profitable to the associations thus formed, and promotive of the general prosperity of the country.

Filtration of Water.

A VERY fine example of the natural purification of water by filtration through sand has been lately shown at Cape Cod. An iron tube has been sunk fifteen feet through the constantly shifting sands of the Cape, fifteen or twenty feet from high water mark, and not more than three feet above it, and the water in this tube rises and falls with the tide; yet, strange to say, although more than one hundred barrels of water have been pumped from it at one time, the water is all fresh, and not the slightest trace of saline taste is perceptible in it. Indeed, so excellent is the quality of the water that outgoing vessels supply themselves with water from this well.

Glazing-Putty.

A NEW glazing-putty, known as "thermoplastic" putty, has been recently introduced in England, and applied to fasten glass into the roofs of railway-stations, green-houses, and other structures where iron sashes are employed. This article hardens in a few hours after being used; but, when exposed to solar heat sufficient to cause an expansion of the glass and metal, it becomes plastic, and on cooling again hardens to its original firmness, thus obviating the danger of breakage, which is so frequent when ordinary glazier's putty is employed.

Pyrography.

THIS is a new art invented in England, and consists, as the name indicates, in printing by fire through a system of metallic cylinders, which burn into the wood any design required, which is indestructible. From its nominal cost and great beauty, its seems likely to take place of much of the expensive ornamentation and inlaid work now done by hand.

THE FIRST PREMIUM for the best tin-lined lead pipe was awarded, by the late American Institute Fair, to the COLWELLS, SHAW & WILLARD MANUFACTURING COMPANY, No. 213 Centre street, New York.

The Fauna on the Bottom of the Sea.

From the German of FREDRICK RATZEL, by ADOLPH OTT.

THE investigations regarding animal life, as it exists in the depths of the sea, which at present absorb so deeply the interest of men of science as well as of laymen, are not of the generally supposed recent origin. Although they had been prosecuted for about thirty years, having since that time not been without some influence upon geological theories, they have unexpectedly appeared again in the foreground, owing to the fact, that their latest results seem to lead us to very surprising and interesting conclusions. The attention which is now bestowed upon the most recent revelations in this department of science, throws much light upon former discoveries, while the tendency to explain the history of our globe from present changes, will certainly insure their eager prosecution. Before I proceed to give an account of the discoveries of the various recently undertaken explorations in the depths of the sea, I propose first to review the investigations on the vertical distribution of its fauna. In this manner, I hope we shall be able to arrive at a truthful estimation of the value and future of that interesting branch of zoological research.

The basis of deep-sea investigations was laid by the Englishman, ED. FORBES, one of the most thoughtful of geologists and well known by his researches upon the glacial period. In an essay, entitled: "On the Relations of the Mollusks Inhabiting the British Coast to the Geology of the Past Tertiary Epoch," published in 1840, FORBES made an earnest attempt to throw light on the yet completely obscure life of organisms buried in the strata of former geological epochs. He proceeded upon the fact, that various depths of the sea were inhabited by various animals, and established four zones of depth, which he distinguished as Littoral, Laminarian, Bryozoan and Coral zones, and which have an actual foundation, since a certain number of animals is confined within each of them. Many geological phenomena were thus explained. It became, for instance, evident that remains belonging to the shore—or littoral zone—must have originated on the shore, and where representatives of the coral zone were discovered it could not be doubted that the surrounding rock had been deposited in the deep sea. Again, with all the difference in structure, which may separate existant from extinct organisms, distinctive characteristics, depending upon habitation and other conditions of life, are not lacking; so it was reasonable to expect, that by viewing the subject in this light, we might arrive at a more thorough knowledge of the history of the globe, than had hitherto been possible. The then existing indefinite ideas are not to be overlooked. At best, they were little better than chimerical. It was, for instance, most generally accepted, that the more ancient of the geological formations had been deposited by a sea covering the entire surface of the earth, without being interrupted by continents or islands. The acceptance of climatic differences and geographical divisions of continents in the ancient epochs of the earth's history, found only a few defenders, and met with still less real understanding. It is, therefore, evident of what importance the researches of FORBES must have been; and if to-day, after surmounting countless difficulties, partly produced by overhasty hypotheses, we have arrived, step by step, at a more convincing and truthful conception of the long passed epochs in the history of the earth's crust, and the creatures inclosed in it, it is mainly due to the investigations of FORBES; for his zones of depth showed at first, that in former periods everything had not been as uniform, and without the now existing diversity, as it had been believed according to the old theory. The science of the zones of depth was further developed by investigations, of which we will only mention those undertaken by FORBES in the Ægean Sea, and the later ones of SARS in the Adriatic. Explorations like these had formerly been made by MILNE EDWARDS on the coast of France, and by SARS on the coast of Norway, yet the chief credit is due to FORBES, who applied the facts thus developed to geology; and as he established the very important truth that, just as the arctic plants grow in the South on the high mountain chains, so arctic animals live in the South at great depth in the sea. He thus gave the impetus to a series of researches of great consequence. It is especially within the past twenty years, that the seas that wash the European coasts have eagerly been searched through by the drag-net. In comparing the specimens found with the petrefactions of the periods anterior to our own, it became evident that arctic animals had emigrated in quite considerable numbers to the south, while of the animals which formerly lived there, and which remind us of the inhabitants of warmer climates, many have become extinct. The farther one proceeded towards the equator, the rarer grew the arctic fauna. However, it is not totally wanting. Near Sicily, and in the Adriatic there are northern fishes, crabs and mollusks, which do not exist in the seas lying between, while on the coast of Norway, about twenty per cent. of the mollusks are of artic origin, inhabiting mostly the deeper parts of the sea. Comparing this with the fact, that in the deposits ascribed to the glacial period there are a number of marine animals which have been driven back to the polar countries, the results of deep-sea investigations attain their proper significance. As during the glacial period polar plants emigrated from the northern to southern zones, their descendants, being now only found on the highlands, where they find conditions similar to those of their winter-like home, those animals emigrated also towards warmer zones, and when the cold of the glacial period disappeared and the south became warmer, they died or returned to the north, or they found suitable habitations in the colder regions of the deep sea.

While thus the researches on the distribution of sea-living animals were of a most beneficial influence upon geology, they remained deficient in one point, leading even to false conclusions. FORBES, by discovering in the Ægean Sea at a depth of from 300 to 350 fathoms, only very few living animals, concluded prematurely, *that in greater depths all life disappeared.* He was led to this view by the then very prevalent opinion, that the pressure in great depths was so great, that no living beings could bear it, and also, that nutriment, light and warmth were lacking there. Yet several factors had not been taken into account in these assertions. Concerning the impossibility of bearing a high pressure, it is not clear upon what facts such a theory was founded, as the organisms in question contain no air vessels and are not at all excluded from the surrounding medium, but are in the most intimate communication with it by certain openings in the vesicular system. In regard to the want of nutriment in the depths of the sea, there was too little known for anything to be said about it, and concerning the absence of light, it may be an impediment to life for most plants, but not for the majority of animals. The low temperature, finally, is just as little injurious as long as it does not sink below the freezing point. The theory of the impossibility of the existence of living beings in great depths was nevertheless considered true, and some facts, which seemed to contradict it—all those published by J. Ross, who in his soundings had fetched up worms and mollusks from a depth of 1000 fathoms—were supposed to be founded upon a defective method of investigation. The more recent researches in the sea have settled this question, and proved that there are living beings of normal development abundant in all accessible depths. A series of new facts are now brought to light, which appear to become of the same importance for geology as the first researches of Forbes, which, by his ingenious exposition, have attained such a conspicuous significance.

The laying of the Trans-Atlantic cable in 1857, was preceded by a series of soundings in the Atlantic Ocean, which afforded the first means of correcting the error of those who believed in the absence of life in great depths. WALLICH, who accompanied one of the American expeditions, found living beings at a depth of 2,500 fathoms, and MILNE EDWARDS, in examining a fragment of a cable, which had been laying for some years, between Sardinia and Algiers on the bottom of the Mediterranean, in a depth of 3,000 meters, found it overgrown with a large number of shells, worms, bryozoæ and corals. In 1861, THORELL and MALINGREEN, who accompanied the first Swedish expedition to Spitzbergen, established that, at 1,000 fathoms depth, the bottom was covered with an abundance of well-developed animals, and the Norwegian scientist SARS, incited by these researches, obtained by his successful drag-explorations, on the coast of Norway, quite similar results.

Americans and Englishmen, finally took an interest in the matter, and examined into the condition of the sea in the Gulf Stream, between Cuba and Florida, and off the Faroe Islands in 1868, and in the Gulf of Biscay in 1869.

Some years ago, a Swedish expedition commenced investigations with drag-nets between Lisbon and the Azores. It is said that they will be extended over large portions of the Atlantic Ocean. From the numerous reports, which have appeared on the respective discoveries of different parties, some points have already become important. They will be presently reviewed, especially those which may serve to furnish conclusions concerning the history of our globe and its inhabitants.

The great tenacity of the mud adhering to the drag-nets had long ago attracted attention. It was ascertained that this property was to be ascribed to the admixture of a jelly-like substance to the fine-grained dirt; and in examining these samples more thoroughly, it was discovered that the jelly which occurs in particles that can be distinguished by the naked eye, consists of protoplasma, the mobile mother-substance of organic life. In this jelly there were a large number of corpuscles imbedded, which were designated as coccolithes, and which, it was soon ascertained, formed an essential part of the mass. They developed themselves in the mass, and HUXLEY, in investigating these corpuscles by means of the microscope, distinguished two forms, which he termed cyatholithus and discolithus. Both consist of organic substances, impregnated with carbonate of lime. The discolithes form merely disc-like, oval bodies, the border of which is inflated. They are convex on one side and concave on the other. On the periphery they are clear and highly refractive, while the centre is of a cloudy and dull appearance. The cyatholithes are of a more complex form. HUXLEY, who first gave a more exact but not perfectly clear account of the constituents of the ocean mud, thus describes them: "Let us fancy a pair of watch-glasses, one of which is smaller and flatter than the other, and both united by a hollow sphere of wax in such a manner that the convex side of the one rests against the concave side of the other. We thus will have a fair representation of these peculiar organisms. Looked upon from the flat side, a clear central space is seen (the one represented by the wax sphere). It is surrounded by a cloudy mass, the circumference from this point of view presenting a radial striation." These two simple constituents of the sea mud, which HUXLEY terms coccospheres, and the number of which is less considerable than that of the bodies just described, bear a peculiar, not yet explained, relation to a sort of hollow sphere; the largest of them are probably nothing else than cyatholithes, united to form a hollow sphere, the smaller ones offer peculiarities of structure which point to an earlier state. As to the relations of the simple forms to these spheres, they are as yet not fully explained. HUXLEY considers it as probable that the cyatholithes unite with each other in order to form the spheres but others hold the opposite opinion, and maintain that the discolithes and cyatholithes are fragments of the coccospheres. No final judgment, however, can be given, until the specimens in question have been more minutely examined. It is certainly strange, how closely these simple organisms are related to each other in early life, and how they pass quite imperceptibly into granules, which are distributed throughout the protoplasma. The view that they are derived from the latter is therefore not unfounded. In this case, the protoplasma would have to be considered as the mother-lye of the deep sea mud, from which the bodies crystallize, as it were. HUXLEY, indeed, compares them with the prisms and other inclosures of the radiolaria-protoplasma, and believes that they are derived like these from and within it. He embraces them, therefore, with their matrice, designating the whole as bathybius (with the specific name B. Häckelii), and proclaiming it thus as a new form of monerra, or most simple living beings. This organism is particularly interesting on account of its relation to the animal life at great depths and to the cretaceous formation. We have mentioned that a considerable number of animals are found even at the greatest depth. Now, it is known that animal life is everywhere dependent upon vegetable life, the office of the latter being to convert inorganic matter into certain organic compounds, which furnish the nutriment for the animal. With the exception of a few species of diatomaceæ, which on account of their rare occurence cannot be taken into account, there are no vegetable organisms at great depths. In examining the sources from which the animals on the bottom of the sea are capable of drawing their food, there remains only the bathybius. It must receive its nutriment like vegetables, by forming organic compounds from inorganic ones, just as this is the case with the protoplasma of the cells in the higher and lower orders of plants.

The relation of the bathybius to the cretaceous formation became the subject of eager investigation on the part of the geologists soon after the discovery of discolithes and coccospheres. Indeed, corpuscles have been found in the white chalk, which are identical with the various calcareous structures of the protoplasma in the depths of the sea. They take no small part in its composition, so that the conclusion which has been drawn in regard to the *rôle* of the bathybius in the formation of those strata rests on a good foundation. On the other hand, it is not improbable that the formation of the chalk is still taking place in the depths of the Atlantic. If all the facts are confirmed upon which these conclusions are based, it cannot be doubted, that at all times in which the bathybius existed, more or less extensive chalk strata have been deposited. Since the Atlantic ocean has been contained in nearly the same limits since the chalk formation, it is not improbable, as accepted by THOMSON and CARPENTER, that the formation of this deposit has not been interrupted since it began to take place.

In this connection, it may be stated, that the existence of the bathybius has been ascertained on surfaces 200 English miles wide and more, the drag-nets having been filled with it nearly everywhere. Almost more attention than this peculiar living jelly, has been caused by the discovery of various species of animals, which belong mostly to extinct families, and which have evidently only in these depths found the conditions under which they could maintain themselves in the struggle for life. Yet, according to the facts which lie before us, it appears as if the importance of these "living fossils," as such forms have been strikingly called, had been greatly overrated. We know still other localities, in which single species or even families maintained themselves in the same stage of organization in which they existed in the chalk—jurassic or carboniferous periods. We are reminded of the once mighty family of ganoid fishes, the coelenterata and worms, of which primitive forms are still found in the fresh waters, while their marine companions have long since arrived at a higher stage of development.

Like these localities, the depth of the sea may become an asylum, as it were, and forms may maintain themselves there which elsewhere would have died long ago. There is nothing new in this, but as the extensive domain of the sea-bottom has as yet been only partially examined, we may surely expect that we may yet become acquainted with a large number of creatures which have been considered extinct. Already the rhizocrinus, discovered at first by SARS, near the Lofoten Islands, and later near the Atlantic coast of North America, are particularly interesting. It is a sea-lily, of a family which is largely represented in the jurassic and cretaceous formations. The pentacrinus, represented here, is a still more important evidence of prehistoric creatures, inasmuch as it flourished in a still more remote age than that of the rhizocrinus. It represents one of the fossils characteristic to the jurassic formation, but now it is only a sterile branch of the group of sea-lilies. A few soundings in the places once inhabited by this species may be sufficient to discover the living with the extinct ones of its family in the ancient rocks. Among animals which were supposed to have become extinct, we will mention the haplophyllia paradoxa, a coral of the otherwise completely fossil group of rugosa, discovered by POURTALÈS, in the depths of the Gulf stream, as well as some species of the peculiar shell-like brachiopods, which are so rare at the present day, but are represented in great abundance in the ancient formations; for instance, in the Jura, and still more in the Caboniferous and Devonian formations. In the chalk period we meet already with the terebratula caput serpentis. The coral oculina and various sponges, which are nearly related to extinct species, have also been brought to light by the drag-net. Quite recently, it was announced in *Silliman's Journal* that a cystide had been discovered, of which it was believed that it had retired from the scene of life since the Silurian. This form belongs to the sea-lilies, and would, if the report is confirmed, be one of the most interesting discoveries as yet made. Prof. DUNCAN has also lately given a representation of corals inhabiting the bottom of the sea. Among the species discovered near the Faroe islands, there are five which are found in the Tertiary, and three which also occur near Florida and Cuba. Among the facts which the discovery of these organisms furnish us, he does not find any which would require the hypothesis of the permanence of the chalk formation on the bottom of the sea, as far as the animal world is concerned. As yet this hypothesis can only be applied upon the formation of the rock, in which to-day animal remains are buried, differing widely from those inclosed in the chalk formation. However, it is still possible, that by a continued searching among animals which were considered extinct, a fauna similar to that of the chalk formation will be brought to light, but as yet only the petrographical, but not the palæontological, continuance of this formation can be admitted.

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor.

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The Chinese as Miners.

IT is not the purpose of the present article to enter upon the discussion of the so-called "Chinese question." Indeed, we hardly feel that this question is in a condition to be properly discussed. Before argument can be made conclusive, it is necessary that a basis of ascertained and acknowledged facts shall be obtained; and this vitally essential preliminary has been thus far flagrantly neglected by the disputants upon the question named. Inflamed by political and other jealousies, each party has dealt in wholesale assertion; and each has endeavored to suppress the facts not favorable to its position. So long as there is a dead-lock of contradiction as to the number, character, habits and capacities of the Chinese in this country, there can be nothing definitely settled as to our duty and policy towards them. We propose at present merely to contribute some facts with regard to their employment as miners.

Since most of the Chinese in the United States are engaged in placer-mining on their own account, it is evident that they are well adapted for success in that branch. Indeed, it is universally acknowledged that they work with greater economy than the whites. In most cases, they buy up abandoned claims, and reopen them with profit.

But deep mining is quite a different matter, and requires a different kind of skill. A knowledge of the varying hardness, tenacity and cleavage of rock and vein-stuff, and of the force of explosives and their effects, is required in this work, if the greatest result is to be obtained from a given expenditure of labor and material. Moreover, a considerable amount of muscular strength and endurance is demanded by the incessant and intense labor of wielding the sledge or hammer.

The experience of the Central Pacific Railroad Company, which employed Chinese in the construction of tunnels, first called attention to their qualifications in this direction. A number of attempts have since been made to introduce them into mines, and generally without permanent success. Sometimes the trouble has been the hostility of other miners, sometimes the difficulty of managing the Chinamen themselves.

At Silon Peak, Nevada, the entire force in the Red Mountain mines is said to have been at one time Chinese; but we understand that a change has been made, and white miners are now employed for a part of the work.

The miners in Morey district, Nevada, were last year Chinese, under a white foreman; and the manager declares that they gave him perfect satisfaction, doing as well as an equal number of white men. But the foreman, during the absence of the manager, discharged the whole lot; and no more have been engaged up to this time.

In many quartz mines and stamp mills throughout the West, Chinese labor is employed for certain inferior purposes, such as dumping cars, surface excavation, etc. But in most cases there is little gained by it, as these positions could probably be filled as well and as cheaply by boys, old men, etc., from non-Celestial climes. The best region for ascertaining the real qualities of this race as miners is, so far as we know, that of the southern mines of California. In Merced, Mariposa and Tuolumne counties, for instance, where the decadence of placer-mining has removed a great part of the skilled white labor, many Chinese have been employed for years in quartz-mining. Even before the construction of the Pacific railroad, there were Chinese miners in the stopes of the Mariposa, Josephine and Pine-tree; and in these noted mines they are still employed to a greater or less extent. We have seen in the Mariposa whole shifts of brawny pig-tail wearers, some of whom had followed the business for ten, twelve or fifteen years.

Putting together the results of experience in all quarters, we arrive at the following conclusions:

1. There are good Chinamen, and bad Chinamen, strong and weak, honest and dishonest. In fact, to adopt an ancient proverb, "There's as much difference in folks as there is in anybody, and more than there is in some!" To manage them successfully, therefore, it is necessary to know them individually, and not call them all "John." They are individuals, and not proprietors in common of either all the virtues or all the vices.

2. It is troublesome, on some accounts, to run a mine manned entirely by Chinese. They put little faith in the promises of employers, and are pretty certain stop st work if not promptly paid. Even after long experience of fair dealing, they do not seem to acquire confidence in this respect; and they remain to-day, as they always have been, the most reasonable in the matter of wages, and the most unreasonably exact in the matter of payment, of all our laborers. No doubt this distrust is due partly to the difference of race, partly to the injustice and dishonesty with which they have been treated; but, whatever be the cause, the fact is palpable, and not unfrequently seriously injurious to mining enterprises in remote districts, where the money does not always arrive just in time for pay-day, and where the miners, once lost, cannot be immediately replaced.

Another obstacle to the exclusive employment of Chinese is the frequency of their religious festivals and holidays. On these occasions, according to the reports of employers in Mariposa county, they leave the mines *en masse*, and cannot be induced to work, for sometimes a week together.

3. Chinese skilled miners are quite equal to those of any other race. In some instances, they surpass white men, employed in the same mines. The number of those who have had sufficient experience to give them equal advantages in the comparison is of course small. Apparently the natural qualifications of the race for this class of work are very great; but it should be borne in mind that only those Chinese who have a fitness for it are likely to undertake it, while many white men pretend to be miners, though unskillful, on account of the high wages paid to that class. On the other hand, good Chinese miners command increased wages. Already they are paid in many localities nearly as much as whites; and there is no reason to doubt that in the course of time the equilibrium will be established, and the quantity and quality of labor, not the race of the laborer, will become the measure of wages. Chinese miners are now receiving $1 75 and $2 per day, where they formerly worked for $1 and $1 25.

4. In hard rock, they do best with single drills, of small steel. So do all miners. The use of the small single drill is becoming quite general in our mines, and is found, where circumstances are favorable, to effect a large saving of cost. One objection to it is, that it is likely to involve underhand stoping, since the single-handed drill cannot conveniently be used in upward holes; and underhand stoping is expensive in mines where the "deads" are packed away in the stopes, and where much timbering is required to support the hanging wall. Of course, where small drills are used, the quicker explosives, such as rifle-powder, dynamite, Hercules powder, (a mixture of nitro-glycerine and common powder) etc., are best.

5. The greatest superiority of good Chinese miners over good Cornish miners is their fidelity. Every mining captain knows that Cornishmen, if working by the shift, need watching, to prevent them from idling; and, if working by contract, have a hundred ways of getting the better in the bargain. Now we do not believe this to be a national characteristic. It is simply professional. When Chinamen shall have worked underground for a generation or two, they also may be up to all these little games. For the present, however, it is certainly true that they are far more earnest and faithful than any other miners. Of course, we do not believe that this degraded race can really surpass the civilized European; but zeal and industry accomplish a great deal; and, as sure as fate, a Chinaman who is earnestly doing his best will beat a Cornishman who is "taking it easy."

The sum of the whole matter appears to be, that good Chinese miners are highly desirable; that their number is small; that the employment and training of raw hands is attended with considerable inconvenience; that the best system, where it is practicable, is to include two or more nationalities in one mining force; and finally, that the question of wages will probably settle itself by a rise in the demands of Chinamen, and a fall in the price of Christians. This is the present aspect of the case; and it does not seem likely to us, under all the circumstances, that the Chinese will either be universally introduced, or universally excluded, as a race. Individuals will develope, as they should do in a free country, into whatever business suits them best, without reference to their birth or blood. If this seems Utopian, we point to an illustration in the Washington gold mine, near Hornitos, Cal., where a white superintendent, a black foreman, and a force of yellow miners, seem to do very well together. Indeed, one might expect distinctions to disappear underground, since there is no difference of color in the dark.

A New Method of Laying Railway Tracks.

IN Europe the scarcity and high price of wood for railway ties and the cheapness of iron and labor, would render feasible the introduction of a system of track-laying which could not be thought of in this country. Even here the wonderful rapidity with which the timber along the lines of our railroads is becoming exhausted, has begun to attract the attention of many of our careful scientific men, both on account of the changes caused in our climate and water-courses, and because they fear that the supply will ere long be exhausted. We are ourselves little troubled with such fears, notwithstanding the formidable array of figures which are adduced in support of their views by intelligent and careful men, because we think that, in the first place, it will be a long time before the timber of the United States will be exhausted, and in the next place, we confidently believe that when timber becomes so scarce and dear that it can no longer be used for a certain purpose, some suitable substitute will be found. Some idea can be formed of the vast yearly consumption of wood for railway purposes, even after the wood has been kyanized or preserved from rapid decay by some other process, when we consider that in Austria nearly two million new ties are annually required to every thousand (German) miles of railway track. How long the supply can be made to meet such an enormous annual consumption, is a question which is anxiously propounded by the European political economist; and whenever wood can be replaced, even by a more costly material, if it is at the same time more durable, the achievement is regarded as affording just cause for national rejoicing and self-congratulation.

The new method of laying railway tracks of which we speak, is the invention of A. PLATTE, the Superintendent of the Austrian Imperial Crown-Prince RUDOLF'S Railway, and has been published by the inventor, after a careful study of the defects of the present system and a comparison of the durability and cost of the present and proposed systems. Mr. PLATTE'S argument in favor of his new plan is published in full in the *Journal of Austrian Engineers and Architects* for September. He begins with a review of the present system and the use of wooden ties, both of which he considers inadequate and insecure. He proposes the use of the best quality of steel rails, of such shape that they can be used on two sides, or, in other words, one side of the rail is used until it is worn out, when the rail is reversed, and the under side, which is of precisely the same shape, is turned up and used till it is also worn out. This he is enabled to accomplish by the use of a rolled-iron longitudinal support, which forms, in fact, a continuous iron box, in which the rail is laid. This trough or box, with a base from six to ten inches broad, is laid directly upon the carefully prepared road-bed, and provided at suitable intervals with lugs on each side, through which bolts are passed, which secure the box to the iron cross-pieces used in place of wooden ties. Thus the cross-pieces or ties are firmly secured to both the inner and outer sides of both boxes. The sides of this box are of different heights, the outer being two or three inches the higher, and to this side the rail is bolted, a piece of hard wood being interposed between the rail and the side of the box. The ordinary fish-bars are used to complete the connection of the ends of the rails. When the rail has thus been bolted to the side of the box, its under side is two or three inches from the bottom, and its sides about the same distance from the sides of the longitudinal box. The space thus left, Mr. PLATTE proposes to fill with melted vulcanized rubber, or with some other substance possessed of considerable tenacity and elasticity. The rail would thus be adequately supported at every point, and such a thing as a broken rail would be almost an impossibility. For curves, both the rail and the box could be bent to the same degree, or in the case of slight curves, the rail alone could be bent and secured in its proper position in the box, by varying the thickness of the pieces of wood placed between the rail and outer side of the box.

The enormous cost of such a system would probably preclude its adoption in this country; but in Europe, where money is regarded as of little consequence in comparison with the benefits resulting from a perfectly safe and extremely durable railway, we can see no reason why the system should not at least be put to a practical test. According to Mr. PLATTE, an English mile of track costs in Austria 25,217 florins, or $12,608, after the road-bed has been prepared, and he estimates that the new system would cost 39,565 florins, or $19,787 per mile. This is a considerable increase in the expense, but one that the inventor thinks would be saved in a few years by the use of his system. At all events the project is interesting, and we notice it more because we think that it may serve as a guide or groundwork for future experiments, than for its practical utility in this country.

Architectural Competition.

THE most important work accomplished by the American Institute of Architects since its adoption of a uniform schedule of architects' charges, and the creation of the chapter system, whereby each city in the country may have its local institute all being united under a common constitution, is the recent a schedule of conditions upon which public and private competitions for architectural works should be conducted. This schedule, adopted at the Annual Convention of the Institute, held in Philadelphia on the 8th and 9th of this month, and recommended to all architects, building committees and proprietors throughout the country, will be found in our report of the Convention in another column. As far as we have been able to ascertain, it is only the second agreement of the kind ever made by any regularly constituted body of architects, the first having been framed by the Congress of German Architects and Engineers, held at Hamburg in September, 1868. In fact, it is based on the German schedule, as the report of the Board of Trustees, with which the schedule was presented, goes on to say. It has, however, been considerably amplified and adapted to the necessities of our own country. The experience of the United States has, in respect to architectural competition, been extensive of late, but, as heretofore conducted, they have failed in procuring such works as the talent of the country can produce. The necessity for this reform has for some time been felt by our best architects, and the action of the Institute, as the only national body of architects, has been demanded by

public opinion of the profession. The rules adopted seem to be conceived in the best possible spirit, and are evidently intended to protect the interests of architects and committee-men alike. They aim at the one great result to be desired by all, the encouragement and development of the best talent of the country and the improvement of our public buildings.

The report of the Board of Trustees (which we are unable to give in the limits of our report, but which will be published in full with the proceedings of the Institute), show that these rules are not the result of the caprice of the moment, but are carefully digested from the views expressed by a large number of architects, at different times, on the occasion of competitions for some of our most prominent public buildings. They cannot fail, therefore, to meet with respectful consideration on the part of all who may hereafter take part, either as architects or as committee-men, in future competitions.

The Duration of the Coal Supply.

WE take the following from an able contemporary, the *Colliery Guardian*: At various times during the fourscore years last past, the alarm has been raised that the Coal Fields of Great Britain were gradually, but surely, approaching exhaustion. Prophets of greater or less eminence have appeared at intervals, and lifted up their voice to warn us of the evil days to come. In the year 1789, JOHN WILLIAMS, mineral surveyor, published a work entitled "The Natural History of the Mineral Kingdom," in which one chapter was devoted to the consideration of the "limited quantity of coal in Britain." Fully appreciating the value of coal, he was filled with apprehension when he thought of the consequences of its failure, and, in the absence of correct data upon which to ground his calculations—for in those days no statistics had been collected and no geological map had been thought of—he came to the conclusion that the exhaustion of the coal beds was an event much nearer than it is now conceived to be. Sir JOHN SINCLAIR and ROBERT BALD, in the beginning of the present century, directed their attention to the same subject, and argued that inasmuch as, on the one hand, the extent of our coal store was fixed and limited, and, on the other, our consumption was of an ever-growing character, the period must some time be reached when the former would be overtaken by the latter. "Even if the Grampian mountains," said BALD, "were composed of coal, we would ultimately bring down their summits, and make them level with the vales." In later years, Dr. BUCKLAND prominently and earnestly brought this subject before the public, both in his evidence before the Parliamentary Committees of 1830 and 1835, and in his celebrated Bridgewater Treatise and address to the Geological Society in 1841. JOHN HOLLAND, in his "History and Description of Fossil Fuel;" and Mr. SOPWITH, in his essay on the "National Importance of Preserving Mining Records," followed in the same steps. The progress of the Geological Survey, and the establishment of a Mining Record Office, as suggested by Mr. SOPWITH, placed the question upon a new footing; and when, in 1860, public attention was once more drawn to the subject by the warm debates on the French Treaty, Mr. HULL, of the Geological Survey, devoted much time and labor to the study of the question, and announced, as the result of his inquiries and calculations, that at the then rate of consumption our coal fields would be exhausted in one thousand one hundred years; but he added: "We have no right to assume that such will be the actual duration, for the history of coal mining during the last half century has been one of rapid advance." Our consumption, in fact, had at that time about doubled itself since 1840, and, supposing it to continue doubling every twenty years, "the total available supply would be exhausted before 2031." Comparatively little notice, however, was taken of any of these forebodings until the autumn of 1863, when the subject was again and more prominently brought forward by Sir WILLIAM ARMSTRONG, in his inaugural address to the British Association, held that year in Newcastle-on-Tyne, the birth-place of the coal trade. In vigorous, earnest language, Sir WILLIAM ARMSTRONG argued that, by combining the known thickness of the various workable seams of coal and computing the area of the surface under which they lie, it was easy to arrive at an estimate of the total quantity comprised in our coal-bearing strata.

Assuming that four thousand feet was the greatest depth at which it would ever be possible to carry on mining operations, and rejecting all seams of less than two feet in thickness, he calculated that the entire quantity of available coal existing in these islands would amount to about eighty thousand millions of tons; which, at the present rate of consumption, would be exhausted in nine hundred and thirty years; but, with a continued yearly increase of two millions and three-quarters of tons, it would only last two hundred and twelve years. He further pointed out that long before complete exhaustion took place, England would have ceased to be a coal-producing country on an extensive scale. Other nations, and especially the United States of America—which possess coal fields thirty-seven times more extensive than ours—would then be working more accessible beds at a smaller cost, and would be able to displace the English coal from every market. The question, said Sir WILLIAM ARMSTRONG, was—not how long our coal will endure before absolute exhaustion is effected, but how long will those particular coal seams last which yield coal of a quality and at a price to enable this country to maintain her present supremacy in manufacturing industry? So far as the north of England was concerned, two hundred years would be sufficient to exhaust the principal seams, even at the present rate of working—and if the production should continue to increase, as it was then increasing, the duration of those seams would not reach half that period. The subject thus presented created no small stir in the public mind: the matter was warmly discussed, and various opinions were expressed upon the theory thus advanced. For our own part, we have no sympathy with the alarmists, and we freely expressed our views upon the matter. The accuracy of Sir WILLIAM ARMSTRONG's estimates, both as regards the future rate of increase in our consumption and the available quantity of coal which might be reached within four thousand feet in depth, were alike questioned; but tacit assent seemed to be generally given to the belief, expressed by Sir WILLIAM ARMSTRONG and supported by Mr. HULL, that four thousand feet was the limit beyond which it would be impossible, or at any rate unprofitable, to pursue mining operations. To this point, Mr. EMERSON BAINBRIDGE has directed his attention, and we have now before us the lengthy and elaborate and exhaustive paper, "On Coal Mining in Deep Workings," which he read before the Institution of Civil Engineers, a short time ago. If the theories which he advances hold good, coal may one day be worked at a depth of seven thousand feet, and the duration of our supply may be thereby extended by centuries. It will be seen at once that these theories are in direct opposition to the views expressed by Sir WILLIAM ARMSTRONG, Mr. HULL, and Mr. W. SMYTH; but, both on account of the great importance of the subject and the ability with which it has been treated, they are worthy of careful and patient investigation. The question involves many important considerations. It may probably be admitted that high temperature can never prove a serious impediment to deep mining.

This question has been dealt with by Mr. VIVIAN. "If," said that gentleman, "heat were produced by additional barometrical pressure, it was equally true that by rarefaction we produced cold;" and he states that the process of rarefaction by machinery is now employed in the deep mines of France and Belgium. This objection to deep mining may therefore be safely dismissed—indeed, it is understood that Mr. HULL himself is now convinced that the high temperature of the strata and air (120 degs. Fahr.) at the depth of four thousand feet is not an insuperable obstacle. A more formidable difficulty, however, presents itself in the pressure of the superincumbent strata; and this may be experienced, not so much, perhaps, in the greater density of the coal, as in the difficulty of supporting the roof and sides of the air-passages and the "goafs." Already, in our present mines, this is often a difficulty, and how much greater is it likely to become when the depth is trebled. Yet, notwithstanding these considerations, which are fairly stated and dealt with in the paper before us, Mr. BAINBRIDGE is of opinion that the difficulty may be overcome. The mode of working coal which he suggests for a depth of seven thousand feet is arranged, as far as possible, in accordance with the principle that the coal should be removed so as to present long lines of fracture, and should be so worked as to cause the superincumbent weight of the strata overlying the goaf to have all its pressure upon such goaf and a minimum pressure upon the coal. Admitting, for the moment, the possibility that neither temperature nor pressure is likely to be found an insuperable obstable—even at the depth of seven thousand feet—we may confidently assume that only coal seams of superior quality and thickness capable of being mined economically, will be followed to any thing like so great a depth. The question of outlay of capital and additional cost per ton due to increase of depth, becomes formidable, and this will be the last court of appeal in all questions of mining. To open out a colliery, at the present day, to a depth of eighteen hundred or two thousand feet cannot be accomplished under an outlay of a hundred thousand pounds, which sum has to be recouped in a term of twenty-five years or so and to bear interest at the rate of ten per cent. in order to form a successful speculation; and this can only be done where the seam is of good quality, proper thickness, and comparatively free from accidental irregularities, such as rock-faults, dykes, and "horse-backs." When, therefore, the outlay comes to be nearly half a million, as it assuredly will be when the depth is seven thousand feet, we may feel sure that only seams of superior excellence will justify such an investment. It is, indeed, possible to conceive the case of a seam of coal of such value that it might be followed even to the depth which Mr. BAINBRIDGE names, but we may safely conclude that there are very few seams in any coal field which will eventually justify such an effort.

Chinese Emigration Falling Off.

THE arrivals of Chinese in this country have been steadily falling off, at least during the present year. This is due probably to the sudden reduction of wages in California, that fact and the other industrial misfortunes of that State having been published in China by the six San Francisco companies for the express purpose of dissuading the natives from immigrating to America. That this has been the result is shown conclusively by the passenger statistics of San Francisco, which report 10,000 arrivals from China and Japan for the first nine months of 1870, against 12,833 for the same period of 1869, a decrease of twenty-two per cent. The departures for the same periods were 2,000 and 2,261 respectively, varying much less than the arrivals.

Washing Diamonds.

THE *Scientific Review* observes that there is a fine opening for the inventor who can devise a really good diamond washing-machine. The South African discoveries have caused several orders to be sent to this country for the best machine that can be purchased; but, unfortunately, nothing of the kind exists, except the jigging hutches used by metalliferous miners. It is to be hoped that the diamonds will not prove to be topazes; but when we hear of 30-carat stones, 40-carat stones, and the like having been found in considerable numbers, and of one gentleman having been fortunate enough to find a diamond weighing 180 carats, or more than the Koh-i-noor weighed before it was cut to a brilliant (it now only weighs 102 carats), we must express our grave suspicions of the importance of the discoveries altogether. Just now, however, diamond-washing machines would sell well. Such machines must be simple, not liable to get out of order, and capable of quickly separating earthly matters from pebbles. It is then necessary to bring every individual pebble fairly in view, as it is by the eye alone that a diamond can be distinguished from the worthless pebbles with which it is associated. For the information of inventors unacquainted with the diamond trade, we may observe that stones, four of which would not be larger than a pin's head, are well worth collecting, and that the machine must be constructed accordingly.

An India-Rubber Car-Wheel.

JOHN RADDIN, of Lynn, has devised a car-wheel, a portion of which is rubber. The mechanism and experiments are thus described in the Boston *Advertiser*: The wheel is cast in three parts—the hub, the web, and a plate to which the hub is bolted. Between the axle and the hub intervenes a ring of solid rubber about three inches wide and one inch thick. The effect of a wheel made in this manner is, that a sudden blow on the web is communicated to the rubber and thence to the axle. It is claimed that this wheel is cheaper, safer, because less liable to break, and more comfortable for the passenger. This new wheel reduces the jar to a minimum, and one can read without the least danger to the eyes. Going around curves, the oscillation is hardly noticeable, and the sound is deadened, so that conversation ceases to be an effort. As to the economy and usefulness of the wheels, Superintendent PRESCOTT is as yet the only one who can speak from experience. Superintendent WINSLOW has had them on two cars, which have run between Nashua and this city since March, and is very much pleased with them. Eight of them were run under a car on the Eastern Railroad 100,000 miles, and were then taken apart and found to be in good condition. The ordinary car-wheel is worn out after 40,000 miles' running; then the axle and wheels have to be taken off and carried to a machine-shop, where the old wheels are driven off and the axle is turned to fit a new set. The elasticity of the RADDIN wheel makes the tread wear twice as long as the common wheel, and then the bolts are taken out and a new wheel is bolted in its place. The same elasticity saves the track and the wear of the flange in going round the curves. Car-wheel manufacturers say the vibration of the patent wheel is very much less than that of the old style, and, the wheel being in three pieces, the liability to break is very much diminished. The wheels are also being applied to locomotives. Several railroads have ordered some of the wheels for trial. A stock company is to be organized for the manufacture. The invention has been patented in Belgium, England and France, and Mr. RADDIN has ten patents in this country.

The Metal Bismuth in the United States.

ONE of the most noteworthy results of the investigations instituted under the authority of the U. S. General Land Office into the mineral products of the several States, is the discovery of this somewhat rare metal. The specimens in the Geological Museum were brought from Archer county, Texas, through which region, it is gratifying to learn that a railroad line is now being surveyed, in connection with other northern counties of the State, all of which have been so much infested with hostile tribes of Indians, that the wonderfully rich deposits of copper and other metals are unapproachable and worthless. The bismuth ore is associated, to some extent, with copper glance, but in separate veins. Its gangue is quartz, through which it is disseminated in small metallic grains, and it only requires them to be heated to about 500° F. to fuse them, and the melted metal is collected as it runs from the furnace. It is of somewhat silvery brightness, with a roseate tinge. It is used in small quantity as a component of Brittania ware; one of its chemical preparations is extensively employed in medicine, and has been extensively applied as a cosmetic under the name of "lily white," in consequence of the delicate white tint of the powder. Its effect, after much use, is to leave the skin of a dirty yellow hue, and of leathery texture. The subnitrate of bismuth is one of the most extensively used remedies in that disease so common here, "dyspepsia." In the thermo-electric batteries, enabling the electro-platers to dispense with the troublesome liquid acid batteries, bismuth is the principal ingredient.

The Texas ores are associated with the other valuable metals cobalt and nickel, which, from the specimens in hand, would seem to be in preponderance. A. R. R.

Clearing Muddy Water.

The cause of the precipitation of muddy matter from water by the action of dilute saline solutions has been investigated by Dr. Ch. Schlasing. Water otherwise pure, but contaminated simply with clay (as may be the case with the water of rivers after heavy rain or fall of snow), becomes at once clarified by very minute quantities of some salts of lime: one thousandth part of chloride of calcium for one part of water effects this purpose in a moment; the nitrate, bicarbonate, and caustic lime act in the same manner. The precipitated substance may be readily separated from the water by filtration, whereas the filtration of the water containing the suspended matter is very difficult, because the pores of the filters become choked. The practical importance of this matter is very great, since it is, for instance, a well-known fact that the water of some rivers does not, in winter time, and after heavy rainfall or snow-storms, become quite clear, even if left at rest in large ponds for a considerable time. The same is the case with the water of the Rhine, which in its lower course is often turbid for weeks together, simply from the effects of very finely-divided clay being suspended even after the water has been at rest in tanks. The water of the river Durance supplies Marseilles with fresh water, the latter being

brought to that city by a magnificent series of works, among which may be mentioned the celebrated Aqueduc de Roquefavour. Certain bitter vegetable substances have been applied both in Egypt and in India for the purpose of rendering the waters of the Nile, Ganges, Indus, and other large rivers, potable, many centuries before the *rationale* of the action of these substances was understood.

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109,166.—CHICKEN-COOP.—John R. Achenbach, Saddle River, assignor to himself, T. Terhune and P. O. Terhune, Hoboken, N. J.
109,167.—STEAM ENGINE.—Herman F. Ambos, Columbus, Ohio.
109,168.—TESTING INSTRUMENT FOR BREWERS AND DISTILLERS.—Moritz Augenstein, Brooklyn, N. Y.
109,169.—ELEVATOR.—Cyrus W. Baldwin, Boston, Mass.
109,170.—WATER-WHEEL.—William Blake, Buchanan, Mich., assignor to himself and Charles H. Parkton, same place.
109,171, antedated November 10, 1870.—MACHINE FOR MAKING SCREWS AND SCREW NAILS.—Reinhold Boeklen, Brooklyn, N. Y., assignor of one half his right to Henry Torstrick, New York City.
109,172.—PIANO.—Ole Bull, New York, N. Y.
109,173.—FURNACE FOR DEOXIDIZING IRON-ORE.—Alexander H. Brainerd, Rome, N. Y.
109,174.—PLANE.—Lewis Bundy, Mooers Forks, N. Y.
109,175.—FRUIT-CRATE.—George Clapp, Geneva, N. Y.
109,176.—HAY-BINDER.—A. R. Clark, Onondaga, N. Y.
109,177.—APPARATUS FOR BLEACHING THREADS, YARNS, &c.—J. Ernest Clarner, Pawtucket, assignor of one-half his right to Benjamin F. Greene and Horace Daniels, Smithfield, R. I.
109,178, antedated November 11, 1870.—SAWING-MACHINE.—John C. Clime, Philadelphia, Pa.
109,179.—ROTARY-ENGINE.—James Constantine, Mansfield, La.
109,180, antedated November 5, 1870.—ROCKING-CHAIR AND STEP-LADDER.—William H. Cook, Bergen, N. J.
109,181.—GUN-CARRIAGE.—T. Couglan, Newton, Mass.
109,182.—LOCK FOR RAILROAD SWITCHES.—Alonzo W. Cram, St. Louis, Mo.
109,183.—STEAM-TILLER.—R. Creuzbaur, Williamsburg, N. Y.
109,184.—SHEAVE.—Alvin Matthew Cushing, Lynn, Mass.
109,185.—MACHINE FOR SPINNING AND DOUBLING SILK, &c.—T. N. Dale, Jr, and George Kraink, Paterson, N. J.
109,186.—MACHINE FOR SQUEEZING PUDDLERS' BALLS.—Samuel Danks, Cincinnati, Ohio, assignor to himself, Joseph C. Butler and L. Worthington, same place.
109,187.—OVEN-PLATE FOR COOKING-STOVES.—Wm. C. Davis, Cincinnati, Ohio.
109,188.—DUMPING-CAR.—Peter K. Dederick, Albany, N. Y.
109,189.—CARRIAGE.—Cnarles N. Dennett, Amesbury, Mass.
109,190.—MITER-BOX.—Justin Devoge, Meadville, Pa.
109,191.—FAUCET.—Charles A. Douglas, Franklin, N. Y.
109,192.—DEVICE FOR CUTTING AND SHEARING METALS.—Isaac Dubois, Boonesborough, Iowa.
109,193.—ELECTRO-MAGNETIC APPARATUS FOR PROTECTING SAFES.—William Duncan and Calvin C. Rowell, Lebanon, N. H.
109,194.—DOVETAILING-MACHINE.—J. P. Flanders, Vergennes, Vt.
109,195.—STEAM-BOILER.—D. Flynn, Fall River, Mass.
109,196.—MILL FOR POWDERING ROOTS, &c.—H. D. Garrison, Chicago, Ill., assignor to Garrison & Murray, same place.
109,197.—STRAW-CUTTER.—G. Sutton Garth, Mill Hall, Pa.
109,198.—GATE.—William Gause, Indianapolis, and Joseph C. Curryer, Thorntown, Ind
109,199.—FEED-ROLL FOR ROSSING-MACHINES.—Charles Gilpin, Cumberland, Md.
109,200.—CLOTHES-DRIER.—Joseph Gnau and William Gnau, Louisville, Ky.
109,201.—BEE-HIVE.—Lawson L. Goodwin, Toronto, Ind.
109,202.—CHAIR AND LOUNGE.—Edward Hagan, New York, N.Y.
109,203.—HORSE AND CATTLE LINIMENT.—Horace H. Hanmer, Nashville, Tenn.
109,204, antedated November 3, 1870.—TOY-BALL.—G. Hartz, New York, N. Y.
109,205.—ATTACHING DICING-STONES TO WHEELS FOR POLISHING LEATHER.—Hector C. Havemeyer and D. P. Burdon, New York, N. Y.
109,206.—OIL-CAKE PACKING APPARATUS.—W. Hawes, Port Richmond, N. Y.
109,207.—GRATE-TRELLIS.—W. M. Heath, Wataga, Ill.
109,208.—ADVERTISING APPARATUS.—William Hebdon, New York, N. Y.
109,209.—SPOOL-STAND.—E. C. Heywood, Worcester, Mass.
109,210.—RAILWAY RAIL-JOINT.—Noah Hill, Leavenworth City, Kansas.
109,211.—POTATO-DIGGER.—G. M. Hoag, Muscatine, Iowa.
109,212.—BOTTLE-STOPPER.—William L. Hoefer, Jeffersonville, N. Y.
109,213.—PORTABLE BOOK-CLAMP.—Charles W. Holbrook and E. F. Butler, Windsor Locks, Conn.
109,214.—WELL-AUGER.—James Ingels and Thomas J. Ingles, Atchison, Kansas.
109,215.—ADJUSTABLE DRAFT DEVICE FOR PLOWS.—Cornealius L. Jackson, Millersburg, Ill.
109,216.—MEDICAL COMPOUND FOR CURE OF RHEUMATISM.—A. J. Jenkins, Virginia City, Nevada.
109,217, antedated November 5, 1870.—POTATO-DIGGER.—Wm. Joseph, Quincy, Mich.
109,218.—BREECH-LOADING FIRE-ARM.—Benjamin F. Joslyn, New York, N. Y.
109,219.—CLOTHES-DRIER.—John Kaspar, Pomeroy, Ohio.
109,220.—COMBINED LOCK AND LATCH FOR SLIDING DOORS.—E. J. Kehee, New York, N. Y., assignor to William A. Hopkins and F. Z. Dickinson, same place.
109,221.—SCAFFOLD-BRACKET FOR ROOFING.—John R. Kennett, Geddes, N. Y.
109,222.—COTTON-SEED PLANTER.—John C. King, Spring Place, Ga.
109,223.—(Suspended.)
109,224.—PAPER-FEEDING MACHINE.—M. E. Knight, Boston, Mass.
109,225.—CORN-PLANTER.—H. Koeller, Camp Point, Ill.
109,226.—COMBINED AGRICULTURAL IMPLEMENT.—L. Lehmann, Monee, Ill.
109,227, antedated November 5, 1870.—MACHINE FOR ATTACHING STUDS OR TUBULAR-SHANKED BUTTONS TO FABRICS.—Joseph H. Lewis, Providence, R. I., assignor to Alfred R. Field, Greenfield, Mass
109,228.—COFFEE-ROASTER.—Nicholas Linden, Chicago, Ill.
109,229.—CULTIVATOR.—Isaac Low, East Fairfield, Ohio, assignor to himself and Ephraim Phillips, Cross Cut, Pa.
109,230.—DRY-GAS METER.—George Lowen and Samuel H. Goldthrop, Pittsburg, Pa.
109,231.—ARTIFICIAL FUEL.—P. M. McGill, Washington, D. C.
109,232.—ELEVATOR.—George McKenzie, Zanesville, Ohio.
109,233.—DEVICE FOR DELIVERING MAIL-BAGS TO CARS.—James B. McLain, Newark, Ohio, assignor to Henry M. Wyeth, same place.
109,234.—DRIER.—John P. Miller, Somerville, N. J.
109,235.—MATCH-BOX.—John Monaghan, Tuckahoe, N. Y.
109,236.—WATER-ELEVATOR.—A. A. Moulton, Providence, R. I.
109,237.—MODE OF PREVENTING THE HEATING OF AXLES OR JOURNALS.—Eliza D. Murfey, New York, N. Y.
109,238.—SPINDLE-STEP.—Eliza D. Murfey, New York, N. Y., assignor to "The Manhattan Packing Manufacturing Company," same place.
109,239.—MATERIAL FOR BEARINGS AND JOURNALS.—Eliza Dexter Murfey, New York, N. Y., assignor to "The Manhattan Packing Manufacturing Company," same place.
109,240.—CLOTHES-POUNDER.—J. W. Norton, Pioneer, Pa.
109,241.—CURTAIN-FIXTURE.—James Lloyd Oliver, Boston, Mass.
109,242.—PISTON-PACKING.—Wm. Ord, Brooklyn, Ohio.
109,243.—BOLSTER FOR WAGONS.—John W. Pearman and Joseph F. C. Lutz, Holden, Mo.
109,244.—CUTTER-HEAD.—D. W. Perry, Wilkesbarre, Pa.
109,245.—MANUFACTURE OF VARNISH.—James B. Pollock, Port Richmond, N. Y.
109,246.—ROOFING-CEMENT.—Oliver Porter, Waterford, Me.
109,247.—CULTIVATOR.—J. Rebman, Binkley's Bridge, Pa.
109,248, antedated November 3, 1870.—PROPELLING CANAL-BOATS.—James Reid, Catskill, N. Y.
109,249.—PAPER-CUTTING MACHINE.—Israel L. G. Rice, Cambridge, Mass
109,250.—PLOW.—Lionel W. Richardson, Roscoe, Ill.
109,251.—DITCHING-MACHINE.—John Wesley Roberts, Hartford City, Ind.
109,252.—FLOOD-GATE.—Samuel Rowland and T. C. Tipton, Williamsport, Ohio, assignors to themselves and G. W. Wiggins, same place.
109,253.—PAPER-FILE.—Wm. W. Russell, Malden, Mass.
109,254.—ROOFING COMPOSITION.—A. Ruttkay, New York, N.Y.
109,255.—BREECH-LOADING FIRE-ARMS.—E. L. Sargent, Watertown, N. Y.
109,256.—EXTENSION PLATFORM STEP-LADDER.—G. A. Schachtel, Newark, N. J., assignor to himself and Robert B. Sanderson.
109,257.—FOUNTAIN-PEN.—F. Schifferle, St. Louis, Mo.
109,258.—SHINGLE-MACHINE.—C. Shelmidine, Summit, N. Y.
109,259.—WASHING-MACHINE.—Hamilton E. Smith and Garret F. Speer, New York, N. Y., assignors to Mary Jane Smith, same place.
109,260, antedated November 5, 1870.—TACKLE-BLOCK.—Roscoe J. Smith, North Haven, Me.
109,261, antedated October 29, 1870.—HAY-RACK FOR WAGON.—Stephen J. Smith, Farmington, N. Y.
109,262.—WASHING-MACHINE.—T. Snow, Social Circle, Ga.
109,263, antedated November 3, 1970.—TAG.—T. Southworth, Rochester, and William H. Lawton, Elmira, N. Y.
109,264, antedated November 3, 1870.—FEEDING HYDROCARBON LIQUIDS TO A HOT-GAS RETORT.—Theodore G. Springer, St. Louis, Mo.
109,265.—MOSAIC-FLOOR.—J. Stegmiller, New York, N. Y., assignor to himself and Ludwig H. Rueckenbag, same place.
109,266.—CURTAIN-FIXTURE.—J. Stephens, Fairview, Ohio, assignor to himself and Jairus Collins, same place.
109,267.—RULING-MACHINE.—J. Stewart, Washington, D. C.
109,268.—PURIFYING ILLUMINATING GASES.—Wm. H. St. John and Peter Cartwright, New York, N. Y.
109,269.—COMBINED HARROW AND SEEDER.—E. Stoner, Greencastle, Pa.
109,270.—STEAM-ENGINE.—C. Strong and A. W. Stickney, Lebanon, N. H.
109,271.—WINDOW-SHADE.—W. Strunk, Nettle Lake, Ohio.
109,272.—MOLDED CARRIAGE-TOP.—G. L. Swett and Joseph P. Lockey, Leominster, Mass.
109,273.—ROTARY PULVERIZER.—J. Thompson, Louisville, Ky.
109,274.—HOOK FOR DUMPING-TUB.—John R. Thorne, Waldoborough, Me,
109,275.—ELEVATOR.—G. C. Timpe, New Orleans, La.
109,276.—EARTH-CLOSET.—E. W. C. Vanderveer, Linden, N. J.
109,277, antedated November 11, 1870.—BREECH-LOADING FIRE-ARMS.—F. Vetterlin, Neuhausen, Switzerland.
109,278.—HOISTING-APPARATUS.—J. H. Violett, Goshen, Ind.
109,279.—WASHING-MACHINE.—H. Warner, Ridgway, Pa.
109,280.—MACHINE FOR MAKING CIGAR-BUNCHES.—W. Weis, St. Paul, Minn.
109,281.—DOOR-STOP.—L. C. Wemple, Rockford, Ill.
109,282.—ROACH AND BUG-TRAP.—T. Williams, Tompkinsville, N. Y.
109,283, antedated November 5, 1870.—MEASURING-CAN.—A. G. Wilson, Chicago, Ill.
109,284.—ROTARY PUDDLING-FURNACE.—E. Wood, Pittsburg, Pa., assignor to himself, Edward Perry, Richard Perry, William McPherson and Edward Williams, same place.
109,285.—GRATE-BAR.—J. Yocom, Jr., Philadelphia, Pa.
109,286.—PADDLE-WHEEL.—S. Bateman, Asniere, France.
109,287.—WASHING-MACHINE.—W. B. H. Beach, Naples, N. Y.
109,288.—FILTER.—John Bean, Hudson, Mich.
109,289.—COMBINED THRASHING-MACHINE AND CORN-SHELLER.—John Bowman, Princeville, Ill.
109,290.—PLOW.—T. E. C. Brinley, Louisville, Ky.
109,291.—PLOW.—T. E. C. Brinley, Louisville, Ky.
109,292.—CONNECTING FIRE-DETECTER WITH THE ALARM.—H. L. Brower, New York, N. Y., assignor to Chas. D. Fredericks, same place.
109,293.—MACHINE FOR CUTTING LOAF-SUGAR.—A. Brown and F. Brown, New York, N. Y.
109,294.—HAND-DRAG RAKE.—E. Brown, Kennebunk, Me.
109,295.—MACHINE FOR CUTTING LOAF-SUGAR.—Felix Brown, New York, N. Y.
109,296.—MACHINE FOR CUTTING LOAF-SUGAR.—Felix Brown, New York, N. Y.
109,297, antedated November 5, 1870.—COMBINED CANE AND WHIP.—Corydon L. Bushnell, Cherry Valley, Ohio.
109,298.—COMBINED LATCH AND LOCK FOR SLIDING DOORS.—J. Capron, New York, N. Y.
109,299.—FRICTION-CLUTCH.—T. Coldwell, Newburg, N. Y.
109,300.—APPARATUS FOR TRIMMING HEELS OF BOOTS AND SHOES.—Louis Cote, St. Hyacinth, Canada.
109,301.—HARVESTER-RAKE.—A. G. Crane and W. T. Johnston, Ottumwa, Iowa.
109,302.—CANCELLING-STAMP.—C. E. Donnellan, Indianapolis, Ind.
109,303.—APPARATUS FOR BURNING PARAFINE AND OTHER HYDROCARBON OILS.—H. Harrison Doty, London, England.
109,304.—SCHOOL-DESK.—William E. Doyle, Eaton, Ohio.
109,305.—HORSE-HAY FORK.—Alvin T. Dunbar and James H. Fellows, Alba, Pa., assignors to A. T. Dunbar and George H. Dewey, same place.
109,306.—SAD-IRON.—T. G. Eiswald, Providence, R. I.
109,307.—MOP-WRINGER.—H. L. Ennes, Birmingham, Ohio.
109,308.—STONE-TRUCK.—W. Evans, Ontario, Ohio.
109,309.—SKIRT-SUPPORTING HOOK FOR CORSETS.—David H. Fanning, Worcester, Mass.
109,310.—RAILWAY-CAR WHEELS.—John N. Farrar, Pepperell, Mass.
109,311.—WATER-ENGINE.—R. Francis, Woodstock, Wis.
109,312, antedated November 12, 1870.—RAILWAY-CAR SPRING.—H. Gardiner, New York, N. Y.
109,313.—BRICK-MOLD.—G. Graessle, Hamilton, Ohio, assignor to himself and L. E. White.
109,314.—APPARATUS FOR THE MANUFACTURE OF SUGAR.—J. W. Hahn, San Francisco, Cal.
109,315.—CORN-SHELLER.—J. R. Hamilton, Kingston, Minn.
109,316.—STUMP-EXTRACTOR.—S. Harman, La Porte, Ind.
109,317.—APPARATUS FOR TRANSPORTING LOADS ON WIRE-ROPE.—Charles Hodgson, Richmond, England.
109,318.—CLOTHES-LINE REEL.—G. Holman, Waterville, N. Y.
109,319.—JOURNAL-BEARING.—D. A. Hopkins, Jersey City, N.J.
109,320.—RAILWAY-CAR WHEEL.—L. B. Hunt, New York, N. Y.
109,321.—BUCKLE.—James C. Hyde, West Haven, Conn., assignor to the West Haven Buckle Company, same place.
109,322.—MOWING-MACHINE.—Benjamin Illingworth, Le Roy, Minn.
109,323.—MUFF AND COLLAR-BOX.—Gustav L. Jaeger, New York, N. Y.
109,324.—FIRE-KINDLER.—J. Kenney, Sr., Baltimore, Md.
109,325.—MACHINE FOR GRINDING AND POLISHING LENSES, &c.—Horatio D. Knight, Elgin, Ill.
109,326.—OPENING AND SHUTTING DEVICE FOR RAILROAD-CAR WINDOW.—John Fannon Lash, Toronto, Canada.
109,327.—INK FOR WRITING.—R. G. Loftus, Chelsea, assignor to himself and Oliver W. Farrar, Boston, Mass.
109,328.—DETACHING-HOOK.—J. A. Lord, Jr., Middletown, Ct.
109,329.—SHUTTER-FASTENER.—I. O. Lucy, Bernardston, Mass.
109,330.—VESSEL'S HATCH.—J. P. Maddox, Belfast, Me.
109,331.—ELEVATOR.—Walter K. Marvin, New York, N. Y.
109,332.—PIPE-COUPLING.—J. H. McGowan, Cincinnati, Ohio.
109,333, antedated November 5, 1870.—CONCRETE-PAVEMENT.—Abraham B. McKeon, Rutherford Park, N. J.
109,334.—CORN AND COTTON-SCRAPER.—G. Milliorn, Pyhalia, Miss, assignor to himself and P. T. Raiford, same place.
109,335.—WATER-WHEEL.—J. Alonzo Morgan, Navasink, N. J.
109,336.—DIE FOR FORGING CARRIAGE-CLIPS.—Frank B. Morse, Plantsville, Conn., assignor to himself and H. D. Smith & Co., same place.
109,337.—SCREW-PILE.—T. W. H. Moseley, Boston, assignor to R. P. Moseley, Samuel R. Moseley and Anna M. L. Moseley, Hyde Park, Mass.
109,338.—AIR-ENGINE.—D. Myers, Chicago, Ill.
109,339, antedated November 5, 1870.—OFF-BEARING TRUCK FOR BRICK-MACHINES.—Walker Olds, Albany, N. Y.
109,340.—PLOW.—Ornan Osborn, Erie, Pa.
109,341.—MANUFACTURE AND APPLICATION OF COLORS FOR PRINTING AND DYEING.—Alfred Paraf, New York, N. Y., assignor to Edward S. Renwick, same place, trustee.
109,342.—DOOR-CATCH.—R. V. Phillips, Conncil Bluffs, Iowa.
109,343.—SAWING-MACHINE.—R. J. Poston, Mainville, Ohio.
109,344.—SHAFT-COUPLING.—W. M. Pratt, Chicago, Ill.
109,345.—TAKE-UP DETAINING PAWL.—G. Richardson, Loweli, Mass.
108,346.—WOOD AND COAL-DUMPER FOR RAILWAYS.—Richard B. Robbins, Adrian, Mich.
109,347.—RAILWAY-CAR BUMPER AND DRAW-HEAD.—A. Ross and John Arthur, Freeport, Ill.
109,348.—TAKE-UP NUT.—T. Ross and W. W. Graham, Rutland, Vt
109,349.—PUMP.—A. Sherman and J. W. Sheaffer, Ill.
109,350.—APPLE-PARER, CORER AND SLICER.—J. Shobe, Upper Principio, Md.
109,351.—SAWING-MACHINE.—Fred D. Smith, Chicago, Ill.
109,352.—PLOW.—Hugh Smith, Moline, Ill.
109,353.—DRAFT DEVICE FOR HARVESTER.—J. M. Smith, Jerseyville, Ill.
109,354.—MACHINE FOR SEPARATING MAGNETIC-IRON ORES FROM OTHER SUBSTANCES.—John Y. Smith, Pittsburg, Pa.
109,355.—FURNACE AND PROCESS FOR TREATING IRON AND OTHER ORES.—John Y. Smith, Pittsburg, Pa.
109,356.—BLAST APPARATUS FOR FURNACE.—Robert A. Smith, Newburyport, Mass
109,357.—WINDOW-FASTENING.—H. St. John, Wilton, Conn.
109,358.—SPRING FOR RAILWAY-CAR TRUCK.—Wm. M. Taylor, Newburgh, Ohio.
109,359.—FLUID-METER.—F. Wagner, New York, N. Y.
109,360.—FUNNEL.—Albin Warth, Stapleton, N. Y.
109,361.—GRINDING-MILL.—Joseph M. Westmoreland, Danville, Texas.
109,362, antedated November 5, 1870.—SASH-HOLDER.—Ed. H. Wheeler, Scranton, Pa.
109,363.—CULTIVATOR.—B. F. Young, Toulon, Ill.
109,364.—FLAVORING-COMPOUND.—W. Zeigler and J. H. Seal, New York, N. Y.
109,365.—CARTRIDGE-BOX.—J. R. King, Washington, D. C. assignor to William M. Tileston, same place.
109,366.—BINDING ATTACHMENT FOR SEWING-MACHINE.—William N. Martin, Boston, Mass.

REISSUES.

4,177.—ICE-CREAM FREEZER.—B. G. Martin, Williamsburg, N. Y.—Patent No. 100,305, dated March 1, 1870; antedated February 14 1870.
4,178.—Division A.—BRICK-MACHINE.—J. Sangster, Buffalo, N. Y.—Patent No. 59,080, dated October 23, 1866.
4,179.—Division B.—BRICK-MACHINE.—J. Sangster, Buffalo, N. Y.—Patent No. 59,080, dated October 23, 1866.
4,180.—BED-BOTTOM.—E. Yeoman, Waukegan, Ill.—Patent No. 67,698, dated August 13, 1867.

DESIGNS.

4,465.—BRACKET.—John H. Bellamy, Charlestown, Mass., assignor to Samuel D. Niles and Benjamin A. Ward.
4,466.—BRACKET.—John H. Bellamy, Charlestown, Mass., assignor to Samuel D. Niles and Benjamin A. Ward.
4,467.—LOCK-FRONT.—F. W. Brocksieper, New Haven, Conn., assignor to Sargent &. Co., same place.
4,468.—PIANO.—Ole Bull, New York, N. Y.
4,469.—STOVE-SHELF.—W. C. Davis, Cincinnati, Ohio.
4,470.—FACE-PLATE OF A SASH-LOCK.—C. H. Eccleston, Oxford, N. Y.
4,471.—BOX FOR PUTTING-UP PAPER-CUFFS.—G. Faul, Boston, Mass, assignor to S. F. Hilton, Providence, R. I.
4,472.—DOOR-BOLT.—F. Fogelstrand, New Haven, Conn., assignor to Sargent & Co., same place.
4,473.—THUMB-LATCH.—F. Fogelstrand, New Haven, Conn., assignor to Sargent & Co, same place.
4,474.—CAR-LOCK.—W. Gorman, New Britain, Conn., assignor to Russell & Erwin Manufacturing Company, same place.
4,475.—SAD-IRON.—W. M. Griscom, Reading, Pa., assignor to Harbster, Brothers & Co., same place.
4,476.—SPOON AND FORK-HANDLE.—Edward C. Moore, Yonkers, N. Y., assignor to Tiffany & Co., New York City.
4,477.—SHOW-CASE.—William Henry Grove, Philadelphia, Pa.
4,478.—CENTER-PIECE.—Samuel Kellett, San Francisco, Cal.
4,479.—CENTER-PIECE.—Samuel Kellett, San Francisco, Cal.

TRADE MARKS.

61.—SNUFF.—Appleby & Helme, New York, N. Y.
62.—COUGH-BALSAM.—William Maddox, Ripley, Ohio.
63.—WHISKY.—C. P. Moorman, Louisville, Ky.
64.—WHISKY.—C. P. Moorman, Louisville, Ky., and Milton J. Hardy, New York, N. Y.
65.—CIGARS, TOBACCO AND SNUFF.—John C. Partridge & Co., Chicago, Ill.

Drying Oil.

THE *Chemical News* says to a correspondent wishing for a good drying linseed-oil, prepared without heat, by which is really understood that it be rendered drying without the usual process of boiling: "Mix with old linseed-oil, (the older you can get it the better) two per cent. of its weight of manganese borate, (this salt is readily prepared by precipitating a solution of sulphate of manganese with a solution of borax, wash

the precipitate, and dry it either at the ordinary temperature of the air or at 100°) and heat this mixture on a water-bath; or, if you have to work with large quantities, with a steam bath, to 100°, or at most 110°. You thus obtain a very excellent light-colored, rapidly-drying oil. By keeping the mixture stirred, that is to say, by always exposing fresh portions to the air, the drying property of the oil is greatly promoted. The rapidity of the drying of the oil after it has been mixed with paint, on surfaces besmeared therewith, does not simply depend upon the drying property of the oil, but, in a very great measure, upon the state of the atmosphere, namely, whether dry or moist, hot or cold, the direct action of sunlight, and the state of the surfaces on which the paint is brought. Really genuine boiled linseed-oil, if well prepared, leaves nothing to be desired as regards rapidity of drying, but it is retarded by various substances which are added in practice, among which especially oil of turpentine is injurious."

A Common Source of Lead in Drinking Water.

By S. DANA HAYES, State Assayer and Chemist, Massachusetts.

WE have frequently called the attention of architects and others to the dangers attendant upon the use of lead pipes for the transmission of water for drinking and cooking purposes. The following article by Professor S. DANA HAYES, of Massachusetts, published in the *American Chemist* for November, points out a new source of similar peril, even more virulently active, though by no means so universally diffused. The invention of tin-lined pipe affords a cheap and effective remedy for the first evil; we need not use poison-pipes; who will deliver us from poison-pitchers?

Several new phantoms, generally taking the form of poisoned articles of food, have lately been conjured up, and some unnecessary apprehensions occasioned in this way. But the evil effects of lead poisoning are so often observed, that I venture to record the following professional experience; believing that attention cannot be too frequently drawn to a subject of such great importance in its relation to the health of mankind.

Nearly three years ago I had occasion to investigate the very rapid corrosion of metallic ice pitchers, and was surprised to find them such a source of danger, to say the least. Since that time I have seen a number of cases of lead poisoning, that could be assigned to no other cause than ice-pitchers used by the patients. It was known to makers and dealers that they corroded very rapidly from the inside, there being workmen who devote their time exclusively to repairing them; and in certain localities, where the well-waters are nearly alike, and particularly active, it was known that an ice-pitcher would only last two years in daily use. And, in one instance, I was assured, that a pitcher was returned to be mended which had lost five pennyweights of lead and other metals, from the inside by aqueous corrosion.

They were then manufactured in great numbers, hundreds of thousands each year, and were sent to all parts of the world from this country, being considered as very useful and highly ornamental.

They are made with double walls, that is, an ornamental outside casing, and an interior ice and water chamber, or the real pitcher itself; an air space of about half an-inch being left between the walls and bottoms, which, acting as a partial non-conductor of outside heat, preserves the ice and cold water for hours.

But experience had taught the makers that such vessels are not handled very carefully by domestics, and that they must be strong enough to resist heavy blows and knocks from the ice, often thrown in, especially on the bottom of the inner chamber. Therefore they were made with reference to resisting such rough usage, and without knowledge of the chemical action afterward found to occur inside.

These pitchers were made with the outer ornamental casing of Britannia metal altogether, and the side walls of the inner chamber of the same metal; but the bottom was of German silver, or copper, all being soldered together, and then electroplated, inside and out, with silver. It is apparent that, with this construction, the inner chamber of each, when filled with common alka-line, aerated, or other corrosive water, is a mild galvanic battery, which increases in power with usage, the sides being composed of—

Tin	91
Antimony	5
Copper	4
	100

and the bottom pieces of copper, or of the alloy made from—

Copper	51·7
Zinc	34·5
Nickel	13·8
	100·0

while the soft solder used contains—

Lead	59·4
Tin	40.6
	100·0

I have examined a great many of these pitchers, both when in use and when sent to be repaired, and observe that the strongest action occurs about the joints, following the solder, that the silver scales off and lead dissolves more or less rapidly in the water contained. There is also another action—a pitting of the Brittania in spots—arising from impurities in the alloy, but this is accidental and does not yield lead.

One remarkable instance was that of a pitcher sent to be mended, simply because "it leaked." The inner chamber was taken out, found to be very much corroded, and a large part of the solder was wanting; but that the galvanic arrangement was complete, and the *battery* in active condition was ascertained by experiments and analysis as follows:

One pint of lake or pond water was put into this pitcher lining (it would not contain more, as there were corroded holes through the sides), and kept at a temperature of 60° F. for a day and night; small portions of the water were removed and analyzed at the expiration of four, twelve, and twenty-four hours, corresponding quantities of fresh water being returned each time with these results:

After one hour, the water contained perceptible traces of lead.
After four hours 0·35 grain of lead.
After 12 " 0·89 " "
After 24 " 1.47 " "
With merest traces of copper and silver.

The water used (Cochituate) was comparatively pure, and and free from saline or other active constituents, such as are generally present in spring and well waters; the temperature was that often attained by woters in ice-pitchers; while the lining was one which had been a short time before in daily use; and complete action was not obtained, as the chamber could not be half filled for this examination.

But in drawing off all the water from the last determination, it was observed that particles of metal were visible, and not strictly in solution, although barely observable.

If these results be compared with the quantity of lead taken up by waters in passing through pipes, we find them surprisingly large. Less than 0.01 grain of lead in a gallon of water has injuriously affected health, as in the old Tunbridge Well case for instance; while the quantity of this metal present in such waters is seldom more than one grain to the gallon. But from the water in this ice-pitcher, I obtain lead at the rate of—

2·80 grains per gallon in four hours.
6·40 " " " twelve hours.
11·89 " " " twenty-four hours.

It is due to manufacturers of ice-pitchers to state that such dangerous galvanic batteries as these are seldom made now—those provided with glass or enameled inner chambers having nearly supplanted the others. But the old kind still come to be repaired, and there are many thousands of them yet in use.

After describing the cases of lead poisoning in the family of LOUIS PHILIPPE, at Claremont, in 1848, arising from the use of water drawn through lead pipes that connected with an iron cistern, M. GUENEAU DE MUSSY then drew this practical lesson which has been so often overlooked: "That contact, even mediately, between lead and other metals, should be avoided in the construction of all reservoirs destined for the conservation of water for domestic use."

Phenic Acid as a Disinfectant.

AT a recent meeting of the Agricultural Society of France, M. CAEVREUL showed that phenic acid is not a disinfectant in the same degree as chlorine, but that it prevents the decomposition of bodies with which it is brought in contact. Extensive use is made of this material to destroy the odor of stables. A white powder, consisting of a mixture of phemate of lime and sulphate of soda, is prepared and sold for the purpose. One-quarter of an ounce a day to each horse, sprinkled in the stalls, is sufficient to totally destroy the odor of the place. In England the cost per head does not exceed two dollars a year. Its employment on board of vessels or cars used for the transportation of animals would prove of the utmost value, and in some countries is largely practiced. M. LEMAIRE has shown that a small quantity of phenic acid, benzine and analine suffices to destroy mycrophytes and a large number of animals belonging to the radiata, insects, mollusks and vertebrata; in fact, all of the lower animals fly from the odor of these substances. An aqueous solution containing one per cent. of phenic acid instantly destroys the itch insect. In the case of insects destructive to vegetation, it cannot be employed upon the leaves, as it destroys both the plant and the animal at the same time, but mixed with coal-tar, earth and sand, it can be applied some distance from the roots. When phenic acid is introduced into the earth or a heap of manure, animals which appear to be devoid of animation suddenly wake up and disappear with marvellous rapidity, and by impregnating the air of a granary or magazine in which wheat or meat is kept, all insects are excluded. The odor of the acid disappears very rapidly on exposure of the grain or meat to the air, so that no trace of it remains. It thus appears that for stables, granaries, magazines, and all places liable to be infested by insects or lower animals, phenic acid is one of the safest and most economical of the remedies hitherto proposed. The bisulphide of carbon, which has very similar effects upon animal life, is itself so disgusting as to preclude its use near human habitations. It has, however, been extensively employed in granaries to destroy the weevil, and for the vaporizing of seed previous to sowing. Benzole, benzine, coal naptha, coal tar, some varieties of petroleum, and the products of the distillation of pit coal, gum benzoin and of some kinds of resin, yield phenic acid in greater or less quantities. The value of coal tar as a disinfectant can be traced to this source. Phenic acid is sometimes called carbolic acid, hydrate of phenyl and phenol. It is capable of very extensive application, and may be produced cheaply. Coffee grounds have also a disinfecting property, and have long been used in the sick room and for the purification of the air of hospitals. Whether the oil of wintergreen would destroy the larvæ of insects has never been observed, but as the distillation of this class of bodies yields phenic acid, it would be worthy of a trial. It may be that destructive distillation is necessary in order to prepare the peculiar principle so obnoxious to the lower animals.—*Exchange.*

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CHARLES ROGERS, Solicitor and Manager.

In connection with the publication of the ENGINEERING AND MINING JOURNAL and the MANUFACTURER AND BUILDER, we have frequently received applications from subscribers and patrons to act as their agents in transacting business with the United States Patent Office; and in view of the increasing number and urgency of such requests, we have resolved to add this department to our business. We have accordingly organized

A COMPLETE PATENT AGENCY,

and now offer our services in procuring patents in this and foreign countries, and transacting all business relating to the obtaining of patents.

Being possessed of superior facilities, in connection with our associate attorneys in Washington and foreign countries, for the successful prosecution of this business, we do not hesitate to guarantee satisfaction to all who may entrust their business to our care.

We have engaged as solicitor and manager Mr. CHARLES ROGERS, a well-known expert in this department. Being a practical mechanic, and having been an examiner in the Patent Office at Washington for a number of years, besides enjoying an experience of more than twenty years as a solicitor of patents, Mr. ROGERS is intimately acquainted with all the details of the business, both in and out of the office.

The specifications, drawings, etc., prepared in our office, will be found to compare favorably with those prepared by any other establishment, while the intimate acquaintance of our manager with the routine of business in the Patent Office, gives us a decided advantage in managing difficult cases.

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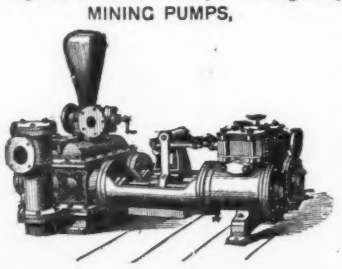

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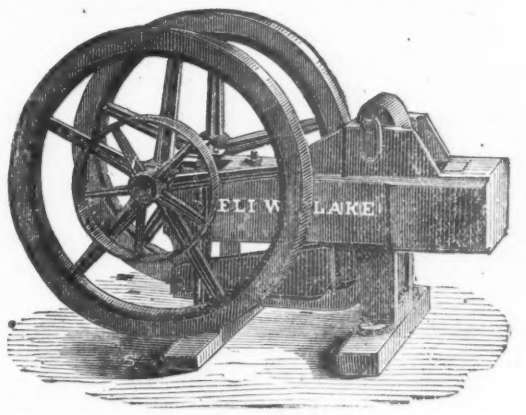

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May 24:1y

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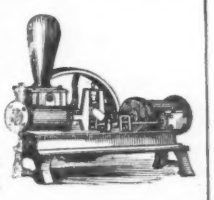

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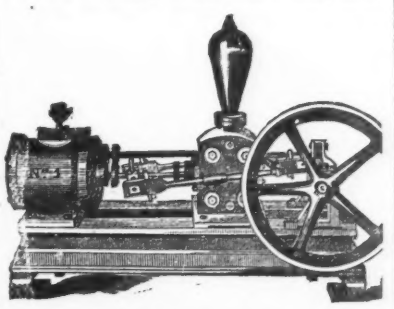

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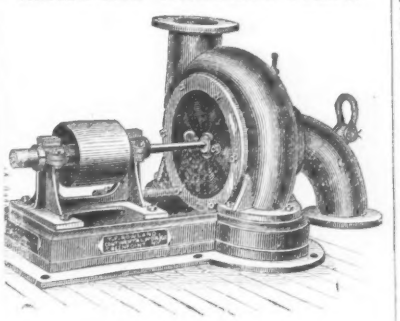

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" The great friction of produced by one mode of ventilation, and how reduced by another
" Pure added to impure (plans.
" Splitting of (plans)
" One current of (plans)
" One current of, and how to adopt separate currents (plan)
" Dividing of, but not into "separate and and distinct" current (plans)
" Crossings (see H on plans)
" Weight of in shafts
" How to find the weight of
" Table of pressure in shafts
Expansion of
ve ity and force
" Rush of, into each division
" Quantity produced by natura ventilation
Splitting, why it should be adopted
Splitting, why the workmen object to Mr. Hopton adopting the mode
Anemometer, measurement of air by, engraving of
Area of a pit, how to find
Barometers, Showing the time of an outlet of gas in mines (engraving)
Bricks, how to find the number in the walling of a shaft.
Buddle's plan
Circumference of a pit, how to find
Coal, several ways of working it out, and why man methods of working it out are adopted
" Working out in banks (plans)
" Working it out in following up banks (plan)
" Working out in pillars (plans)
Working out in long wall (plans)
Working out in drifts (plans)
" Working out with no regularity (plan)
" Working out by the "end way" or in endings (plan)
Cubical Contents of a pit, how to find
Dialing, the mode of
Dials, several engravings
" How constructed
" How fixed in mine surveying
" Needle, its variations
Diameter of shaft
Dip of mine, how to find and lay on (plan)
Explosion, the power of an
" At Lund-hill, in what part of the mine it was supposed to take place (plan)
" How the power may be diminished
Furnace, how to find the horse-power of
" The place of fixing, to produce the largest ventilating current
" Engravings of ground floor, front and back view
" Remarks upon
Gases, (carbonic acid) composition of
" Do. properties of
" (After, or choke damp) composition of
" (Carburetted hydrogen) do.
" Choke damp and carbonic acid, not one and the same in quality
" The effect produced on people by inhaling such
" The quantity required for an explosive mixture
" The elasticity of
" The weight of
" The nature and quality of
" Why some mines generate and produce more than others
" Why some mines generate a mixture of
Goaf, or gob, how tramrods are made through (plan
Lund-hill (plan)
Managers, who are best competent to manage mines
Miscellaneous questions
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Planning, how workings are laid on the plan
Regulations (see R on plans)
Safety Lamps, why flame will not penetrate through, engraving of
Sections on mechanical ventilation
Summary of accidents
Surveying, how mines are with the dial
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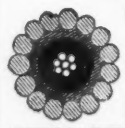

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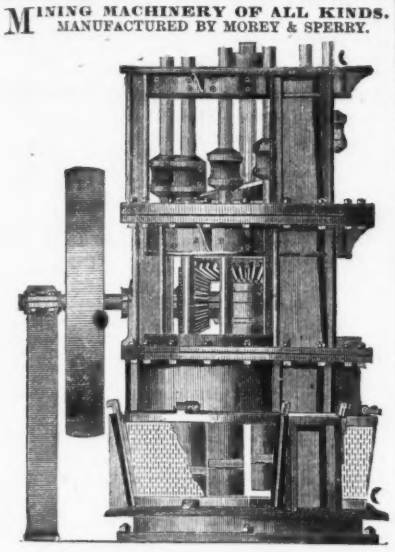

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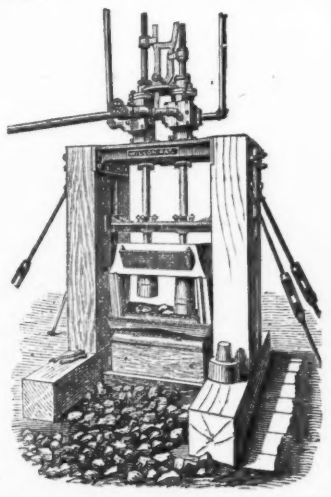

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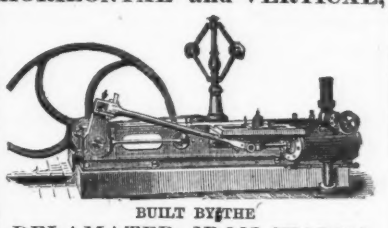

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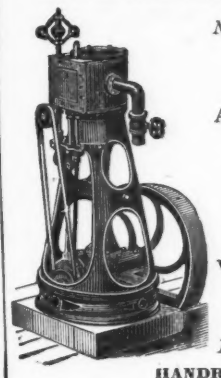

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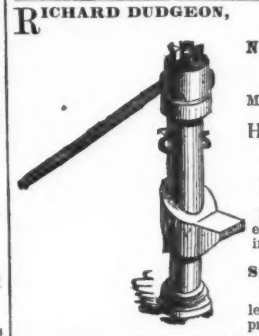

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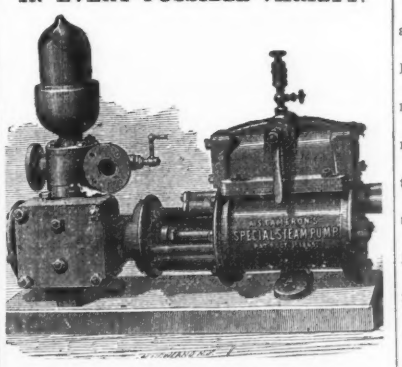

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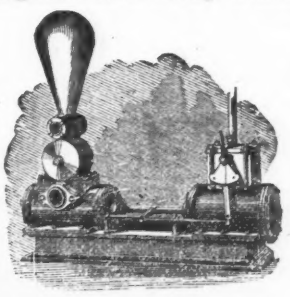

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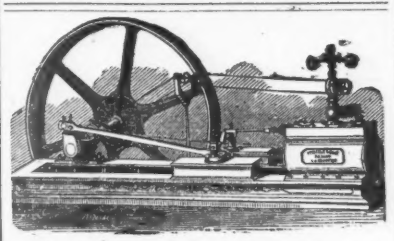

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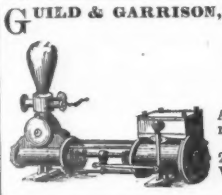

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- XXVIII.—Mining law of Switzerland.
- XXIX.—Mining law of England.
- XXX.—Mining regulations of Australia.
- XXXI.—Mining laws of Canada.
- XXXII.—Conclusions.

SECTION VII.—*Mining Education:*
- Chapter XXXIII.—Means of disseminating information with regard to mining and metallurgy: the National School mines.

SECTION VII.—*Mining Education—Continued.*
- Chapter XXXIV.—The Freiberg School of Mines
- XXXV.—The Paris School of Mines.
- XXXVI.—The Prussian School of Mines.
- XXXVII.—The School of Mines at Clausthal.

APPENDIX.—Statistics of bullion, ores, etc., at San Francisco, for the Year 1868.

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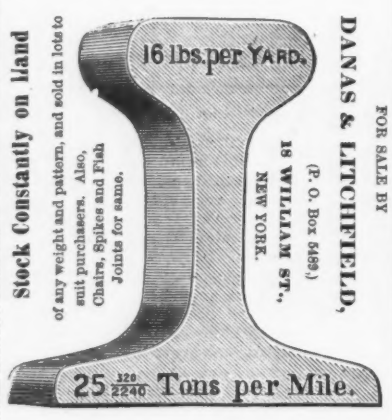
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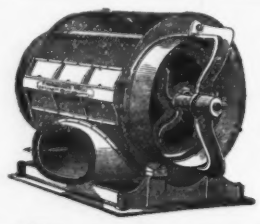

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